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ARCHIVES OF OPHTHALMOLOGY.

THE USE OF LIVING SUTURES IN THE TREATMENT OF PTOSIS.[1]

BY DR. W. W. WRIGHT, TORONTO, CANADA.

(With three illustrations on Text-Plate VII.)

HAVING followed with considerable interest the experimental and clinical studies of Drs. W. E. Gallie and A. B. Le Mesurier in the use of living sutures and having discussed with Dr. Gallie the possible uses of these sutures in ophthalmic surgery, it appeared to us that the use of living sutures would be an ideal method of treating ptosis.

The research work upon which Gallie and Le Mesurier have based their clinical work extended over a period of years and was reported in a paper read before this Academy in March, 1921 (1). For a thorough understanding of this study I would refer you to this paper but I do not think that it would be out of place to quote here their conclusions which were as follows:

"(1) When a piece of fascia, aponeurosis, or tendon is cut free from its circulation, and transplanted into such a position in the same animal that it can receive an adequate supply of lymph, it will continue to live, and, for all practical purposes, will continue to live unchanged.

"(2) During the first few weeks following the operation an inflammatory reaction occurs in the tissues surrounding the transplant which results in its complete investment in a vascular areolar membrane and in its healing to those tissues with which it comes into immediate contact.

[1] Read before the Ophthalmological Section of the Academy of Medicine, Toronto, January 9, 1922.

"(3) Such transplants heal to surrounding structures by means of new-formed connective tissue and it is upon the strength of this connective tissue that the firmness of the fixation of the transplant depends. If the operation is performed without the complete removal of the areolar tissue which normally ensheathes the transplant, the union will have merely the strength of areolar tissue. If, on the other hand, the areolar membranes are completely removed and the transplant and the surrounding tissues placed in actual contact, the nature of the union will be in the form of a fibrous scar, which materially increases its strength. As scar tissue, however, is very apt to stretch under even moderate degrees of strain, it becomes essential to place the transplant in contact with the surrounding tissues over a considerable distance in order that the amount of scar tissue in the line of union may be sufficiently strong to withstand any degree of physiological strain.

"(4) In many cases the mechanical difficulties in the way of placing the transplant in actual contact with the surrounding tissues over long distances are so great that the method just described becomes valueless in ordinary operative surgery. These difficulties, however, can be completely overcome by employing the fascia or tendon as a suture and by weaving it securely into the surrounding tissues. In this way, the necessity for removing the areolar membranes from the surfaces is eliminated and one no longer depends upon the healing of the transplant to the surrounding tissues for the success of the operation. The strength of the bond of union will now depend on the strength of the transplant itself and of the structures into which it is woven. If the surgeon is careful to choose for his living suture a material which is known to have the necessary strength to withstand the anticipated strain, and if the suture is securely anchored into tissues which can also tolerate this strain, the permanent union of these tissues can be confidently expected."

For the treatment of ptosis, sutures of fascia lata were chosen as they are of sufficient strength for the desired purpose and are easily obtained.

These fascial sutures can be used to replace other sutures in many of the operations described in the textbooks, that have for their object the substitution of the action of the

ILLUSTRATING DR. W. W. WRIGHT'S ARTICLE ON "THE USE OF LIVING SUTURE IN THE TREATMENT OF PTOSIS."

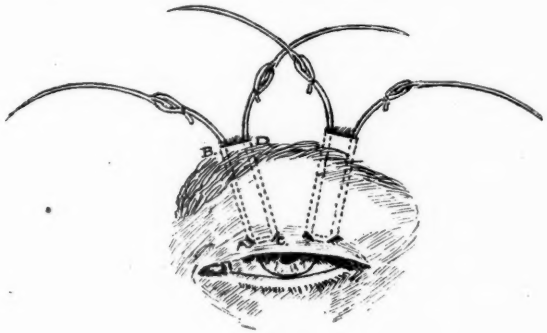

FIG. 1.

Modification of Pagenstecher's Operation Using Buried Sutures of Fascia Lata.

FIG. 2.

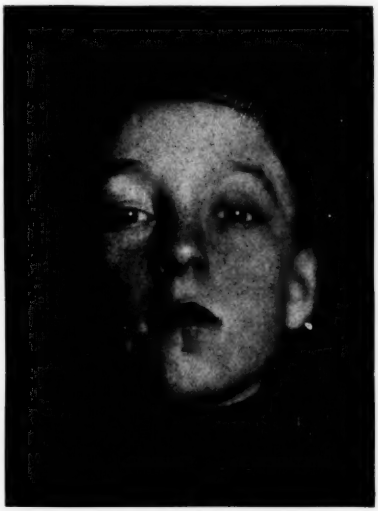

FIG. 3.

Result Thirteen Months after Operation for Left Congenital Ptosis. The Two Pictures Show the Considerable Degree of Motility Obtained.

frontalis muscle for that of the levator palpebræ, but the writer prefers a modification of the Pagenstecher operation on account of its simplicity, lack of scarring, and good results obtained.

The Operation.—A longitudinal incision is made over the outer side of the thigh, five inches in length. The fascia lata is exposed and cleaned throughout the full length of the wound. Two parallel incisions are then made in the fascia lata 4 to 5*mm* apart. The piece of fascia between these incisions is then freed from the underlying muscle. Before cutting free this strip at its extremities it should be split longitudinally into the two required sutures as this is more easily done in situ than after removal. This part of the operation can well be done by an assistant while the operator is preparing the lid area and later the assistant can be closing the thigh wound while the operator continues with the main part of the operation. In closing the thigh wound the fascia lata should first be carefully closed with catgut. The sutures being prepared, we can now proceed with the lid part of the operation as shown in the diagram (Fig. 1). The sutures are threaded at both ends on to fairly large, slightly curved needles with large eyes. As the sutures are short and slippery, it is necessary to tie them on to the needle with fine strong silk as shown in the figure. A horn plate is placed beneath the lid and two small puncture wounds are made through the skin at A and C with a sharp pointed tenotome, about 6*mm* above the lid margin. A transverse incision, B–D, 1*cm* long, is made just above the brow. One needle is now entered at A and carried upwards subcutaneously to emerge at the nasal extremity of the incision B–D. The other needle of the double-armed suture is then entered at A, passed under the skin, brought out at C, re-entered through the same hole and brought out above at the temporal end of the incision B–D. A second similar incision is then inserted in the outer half of the lid. The ends of the sutures are now drawn on until the lid is raised to the desired height and then tied in the transverse wounds. Before cutting off the ends it is advisable to draw the knot out of the wound slightly so that it may be reinforced by passing through and tying around it a fine catgut ligature on a fine curved needle. The transverse incisions are then closed with one or two skin sutures and a

dressing carefully applied. The dressing should be left on for a week.

In December, 1920, I presented before this section of the Academy, a boy, V. W., with a left unilateral congenital ptosis which had recently been operated on by this method. He has been kept under observation since that time and when last seen three weeks ago there had been no tendency to relapse. His present condition is shown in these photographs taken thirteen months after the operation (Fig. 2). One photograph shows the patient with the eyes closed, the other with the eyes open, thus demonstrating the considerable degree of motility of the lid obtained by the operation. In all eight lids in five patients have been operated on by the living fascial suture method by Dr. C. E. Hill and myself at the Hospital for Sick Children; all in cases of congenital ptosis and all with very satisfactory results. Most of these cases have been seen recently and continue to do well.

As a result of our experience I would recommend the strictest possible aseptic technique, which should include a thorough cleansing of the field of operation, shaving the brow and covering over the face with the exception of the immediate area of the lid to be operated on. In four lids of this series more or less infection occurred, but in spite of this infection all did well and in no case was the ultimate result thereby impaired.

Our experience with this method of operation for ptosis is still somewhat limited and the time elapsed since the first case was operated on is too short to judge of the permanency of the result. Nevertheless we believe from the good results obtained so far that we have in the living suture operation a method of treating ptosis that is at least as good as any method previously introduced.

REFERENCE.

1. W. E. Gallie and A. B. Le Mesurier. "The Use of Living Sutures in Operative Surgery." *The Canadian Medical Association Journal*, July, 1921.

INDUSTRIAL TRAUMA IN RELATION TO THE DEVELOPMENT OF OCULAR TUBERCULOSIS, SYPHILIS, AND NEOPLASM.[1]

By Dr. HANS BARKAN, San Francisco, Cal.

IN bringing this subject before you, there are no new facts to present. The literature is large, dating back to the times of Hippocrates. Since the introduction of Workmen's Compensation Laws in Switzerland in 1875, followed by Germany in 1884, Austria, 1887, Norway, 1895 and in our country within recent years, clinical and experimental facts allow certain definite conclusions regarding the relation of trauma to ocular tuberculosis, syphilis, and neoplasm and can be accepted as a working basis. In our country this matter has become of importance to us as ophthalmologists because of our capacity as referee under the Workmen's Compensation Act. We are often required to state our opinion regarding the effect of industrial trauma on the eye as a matter of official record before the court or the Industrial Accident Commission, and in no case do we meet with as much difficulty in forming a definite judgment for the consideration of the Accident Commission and the insurance carrier regarding the medical aspects of the case as in those where trauma plays or seems to play a rôle in the production of ocular tuberculosis, syphilis, and neoplasm. Accidents occur to employees who are suffering from some existing disease or from some preëxisting disability; the existing disease may be so marked that trauma plays a secondary rôle in its further development. On the other hand, it may be latent or incipient and its development following trauma throws the responsibility for the development or

[1] Read before American Association of Ophthalmology, Otology, and Laryngology, October, 1921, Philadelphia.

acceleration of the disease process on the trauma. These coincident conditions present many perplexing problems. We must decide to what extent the accident is responsible for the disability. We must decide whether or not the preëxisting condition was aggravated by the accident or whether the injury itself was complicated or the healing deferred by the already existing condition. These problems arise with great frequency in the practice of those of us fortunate enough—and I say this with emphasis—to be called upon frequently for industrial service and as referees. There is no part of our work calling for greater thoughtfulness, care, or keener judgment than a fair estimation of the interests and rights of the injured. A careful examination not only of the eye, but of the man, and a careful history are essentials. The compensation to be awarded, the term of compensable disability and the general legal and moral status of the case hinge often on the surgeon's decision with reference to the disease factors mentioned. For this reason it seems pertinent to review shortly the status of trauma to the eye in its relation to tuberculosis, syphilis, and neoplasm.

The great majority of traumatized eyes heal according to the amount of injury and the knowledge and skill of the surgeon. A certain percentage, however, show deviations from the usual which lead us to suspect complicating factors. These factors may be the general poor condition of the patient, some chronic disease, or a local process about the eye such as the teeth, tonsils, or sinus infections, all or any retarding healing. If the injury to the eye is of an industrial character, all complicating factors must be dealt with as part and parcel of the injury. Taking up a specific example, let us consider how syphilis, especially as expressed in interstitial keratitis, plays a rôle. Whether trauma can be regarded as a provocative agent in the production of an interstitial keratitis has long been a moot point, denied by some excellent authorities and as positively affirmed by others. Personally I have seen three cases in which the trauma, its character, and the time relation of the appearance of the interstitial keratitis were clear enough to establish for me at least that trauma as such and in a predisposed individual can stand in direct relation to the appearance of an interstitial keratitis. Igersheimer, the noted

authority on syphilis and its eye manifestations, denies that trauma as such is a cause, admitting, of course, that there are well authenticated cases following blows, but believing that the appearance of interstitial keratitis is a pure coincidence. Statistically we face the fact that in Breslau among 670 cases, trauma had to be considered only twice. Igersheimer in 300 cases found not a single case pointing toward trauma. It is also to be remarked that many an eye which has suffered from interstitial keratitis is injured or operated upon without consequences. Igersheimer in experimenting with rabbits injected through the blood stream in whom luetic manifestations appeared, attempted repeatedly to obtain a specific characteristic by trauma to the cornea, but without success. In spite of a good deal of negative evidence, I believe that traumatic cases are not so infrequent. To explain the process is difficult. Some theories might be considered. We can assume that luetic toxins are in the circulation and that in the cornea in such cases antigens and antibodies may meet and that colloidal precipitation from a blow might start the process. If at a time when possibly such a process is just ready to start of its own accord a sufficient trauma occurs, we can believe that such might act as an activating agent. If now the second eye undergoes the same process a few weeks or months after, it does so independently of the injury to the first one, this first one having been in a sense artificially made, the first one by the activating trauma. The other mode of origin may consist of the direct activation of dormant spirochæta present in the cornea. As far as I have been able to discover in the literature only one questionable case has been demonstrated pathologically, and in general interstitial keratitis is not taken to be a direct spirochætal infection. Here the following might be considered. Recent bacteriological investigations have shown that the absence of the causative organism at the time of the examination of the tissues is not uncommon. A few organisms may be activated by trauma, their toxins liberated and thereupon the reaction of the tissues to the toxins forms the clinical picture. When weeks or months after the process the tissue is examined, there may be complete absence of demonstrable organisms. Such may very well be the case in the cornea. Few eyes are lost by interstitial keratitis and these eyes have

been examined a long time after the initial process, so that one can scarcely deny that it may not after all be a direct spirochætal infection. That trauma may play a rôle in activating the process cannot be denied. We have too many examples in general medicine which clearly show that trauma to the bones, joints, or tissues of a syphilitic, acquired or congenital, results in a more complex process of healing and in a stormier clinical picture than otherwise. As long as we are unaware of the pathogenesis of interstitial keratitis, any attempt to explain the effect of trauma is, of course, purely hypothetical. We must acknowledge in fairness to the individual its possibility as a sequence to trauma, provided the following facts are established:

1. The trauma must be positively ascertained and must be more than such as the individual is exposed to in the ordinary course of his employment (for instance dust, chemical fumes, wind, etc.)

2. The trauma must strike the cornea itself, and must cause a definite irritation.

3. It must be estimated by an expert that the interstitial keratitis is not present at the time of the injury, and that the consequences of the injury are an interstitial keratitis.

4. It is finally deemed by some authorities that a definite irritative condition of the eye must exist from the time of the injury to the time of the appearance of the interstitial keratitis. This, however, I do not subscribe to and believe that if trauma *can* induce an interstitial keratitis, a blow on the eye *not* followed by a period of irritation can lead to the appearance of interstitial keratitis.

In tuberculosis of the eye following trauma, our footing is more secure than in the case of syphilis. The activation of pulmonary tuberculosis by chest trauma is well known as is tuberculosis in the bones, joints, glands, and meninges following trauma. These well-known clinical facts are supported by many clear-cut experiments. It is obvious that injury per se cannot cause tuberculosis of a bone or joint or eye. The tubercle bacillus must be present. Autopsy statistics show that over the age of puberty 98% show some hidden or active tuberculous lesion. A sufficient injury may provoke a latent process into action. This injury need not be severe, as pointed

out by Wolff-Eisner. Slight injuries are not infrequently followed by tuberculosis. Mock in his *Industrial Medicine and Surgery* states that trivial trauma is frequently the cause of the development of tuberculosis, and in the eye we have to consider the appearance of tuberculosis following trivial injuries quite frequently. How does a tuberculous iridocyclitis, for instance, develop after trauma? The organism may already be present inactive and be started into activity or the hyperæmia of the iris or small capillary hemorrhages or thrombi establish the iris as a locus minoris resistentiæ. The time relation of the blow to the appearance of tuberculosis of the iris, for example, is interesting. There is no tissue of the human body where we have an opportunity to see as clearly and constantly the development of pathology as in the eye. For this reason it is not surprising that a distinct tuberculous process can be ascertained as occurring within nine days after trauma and be diagnosed as such. In the first two weeks after injury an iritis can only be definitely established as a tuberculous one if actual tubercles appear. These I have seen as early as the seventh day after the injury. It can be presumably diagnosed as tuberculous if the trauma as such would not ordinarily be followed by iritis and if with or without demonstrable tuberculous lesions elsewhere, a focal reaction is obtained with tuberculin.

In discussing the relation of trauma to malignant disease of the eye, we enter upon such a huge field that it is scarcely possible to do it justice in this paper. For a most splendid chapter on the general subject of trauma and malignant disease I would refer you to a paper in *The California State Journal of Medicine*, vol. xix., No. 2, page 54 on "Relation Between Trauma and Malignant Disease from an Industrial Viewpoint," by W. Ophüls. As Ophüls says: "The etiology of 'tumor' is woefully deficient. Whether it is due to abnormality in development, to inflammation, or connected with the more normal processes of hypertrophy and regeneration. Any break in continuity, often the result of trauma, carries with it the possibility of development of true tumor." Clinically we know that repeated and continued traumatic influences are more likely to terminate in tumor than a single trauma. The instances are too numerous and well known to spend time

upon. The relation of single trauma to tumor is much more doubtful and Ophüls states that there is no case so far recorded which proves its existence with scientific accuracy, but there is sufficient evidence to make it justifiable to give the patient for whom the question of insurance depends the benefit of the doubt. The rules have been variously formulated, but there is a very good consensus of opinion on the essentials as follows:

1. The occurrence of the trauma must be proved.

2. The trauma must be severe enough to appear effective.

3. The growth must develop at a place likely to have been injured by the trauma.

4. It must be reasonably certain that the traumatized part was normal before the accident.

5. The time elapsing between the trauma and the appearance of the tumor must agree with our scientific experience in the rapidity of development of the particular tumor under consideration. The time must not be too short, not less than a few weeks, nor too long—the outside limit is usually given at about two years. Ophüls' conclusions are that a single trauma not followed by complications is a rare cause of tumor. We find that Fuchs in 1882 estimated that among 259 choroidal sarcomata examined 11% might have been traumatic. The physician may not mention it frequently in his report, but the patient often states that trauma started the process. We, of course, have to take most of these statements with a grain of salt. Is it conceivable that a choroidal sarcoma may originate from a blow on the eye? Again not knowing the real origin of tumors, we cannot be positive, but it is to me perfectly feasible that a jar or blow sufficient to cause even microscopic alterations in the position of the elements of the choroid might be the starting point of such a case. There may be some slight break in continuity, or some small hemorrhage to disarrange the cells. We have neither time nor space, nor is it the object of this paper to go into the matter of tumor origin. The time element in regard to the injury is even more important than in tuberculosis and syphilis. If we find a tumor developing a year or two years after the trauma it is not in view of the well-known rapid growth of sarcoma, very logical to attribute the tumor to the trauma. If, however, a few weeks or a few months following a well-established blow on the eye we find a

sarcoma developing, we can scarcely deny that there may be a relation between the trauma and the tumor.

By quoting some specific cases, I may bring out certain points in the industrial relation of trauma to syphilis, tuberculosis, and neoplasm.

(1) A. B. Employed in an ice producing plant, the work consisted of loading ice blocks into cars or platforms. While at this work, no eye complaint. Whenever sent to bring ice blocks from dark and cold refrigerator plant out to sun porch notices after three or four days that both eyes become inflamed and painful. This will then last for several weeks. This has occurred six times in the course of the last six years' employment so that he is now never asked to perform this type of work. Saw him ten days after initial symptom. Marked plastic iritis, precipitates on Descemet's membrane, vitreous opacities. Tuberculin reaction highly positive with focal reaction. Fibrosis both apices.

(2) E. H. Delivery boy unloading card board boxes filled with envelopes from automobile. Three boxes approximately weighing fifteen pounds fell from height of three feet. Struck left upper lid. Ecchymosis of lid, subconjunctival hemorrhage. No corneal lesion. Vision normal. Nine days after stated that for last two days the eye had been extremely tender, and that he had almost complete loss of vision. Iris discolored. Eleven small tubercles and three as large as pin-heads. Both upper lobes extensive tuberculous process. Due to rapid extension of process with secondary glaucoma, enucleation.

Pathological Report.—Tuberculosis of iris, ciliary body, and choroid.

(3) F. M. Boy struck by piece of rock on eye. Hemorrhage subconjunctival. Sluggish iritis lasting for three weeks developed two days after blow and then died down. Very marked focal reaction with tuberculin. History of cough, sputum filled with tubercle bacilli, marked cavity formation in both lungs.

In all of these three cases the process was called the direct result of the injury and full compensation awarded.

(4) Washerwoman. Age 32. In wringing out bath towel struck right eye cornea rather forcibly. Seen that day. Epithelial abrasion. Marked photophobia and lacrimation. Symptoms vanished under treatment in

three days. Ten days later she appeared with a beginning vascular type of interstitial keratitis, which ran a typical course. Seen for three weeks, and then did not return so cannot state fate of second eye. Hutchinson's teeth and quite deaf. Wassermann triple plus.

(5) Expressman struck on left eye by trunk strap very forcibly. Iridodialysis. Subconjunctival hemorrhage. Hyphæma. Usual treatment. Three weeks afterwards rapidly developing typical interstitial keratitis. No congenital stigmata. Wassermann XXX. Family history negative. Three healthy brothers. Two healthy sisters. Venereal history denied. Five weeks afterwards the right eye started a similar process.

(6) A. J. Bookkeeper in bank. Age 62. Ledger weight approximately two pounds fell from shelf three feet above. Hit him as he was looking up, striking his left upper lid forcibly. Seen three weeks after injury. Stated, as was confirmed by local eye specialist, that his eye was only slightly bruised and vision normal. Two disk diameter from disk temporally and three papillæ diameter in size, elevated 4 D. a bluish mass diagnosed as sarcoma of the choroid. Tension normal. Vision $\frac{1}{10}$. Enucleation.

Pathological Diagnosis.—Melanosarcoma of choroid.

(7) O. E. Lumberjack in mill. Revolving leather belt caught and threw him. Struck head. Unconscious 10 minutes. Resumed work an hour later. Same day noted and stated to one of the other workmen that he saw nothing with his right eye. Large melanosarcoma. Tension + 1. Seen three weeks after injury. Enucleation. Pathological diagnosis confirms. This man was in good health four years afterwards.

(8) Dr. O. C. Ship surgeon. Swinging rope struck on right eye. States that he knows the eye was normal afterwards, owing to the fact that he made some microscopic examinations a few days after the trauma. Seen three weeks after trauma with mass, chocolate color, in macula. Elevation 4 D. Vision, counts fingers in 3 feet. No tension. Enucleation.

Pathological Diagnosis.—Melanosarcoma choroid.

In the tuberculous cases quoted, it seems quite clear that from the industrial as well as medical standpoint the trauma was the direct exciting cause of the tuberculous lesion.

With reference to the syphilitic cases, there may be some doubt as to the relationship. The blow may only have been incidental and interstitial keratitis might have developed at any time without trauma. When, however, the time interval is so definite in its relation to the trauma as it is in these cases, I believe it hard to assert that the injury has not had a very decided influence in bringing on the attack at that particular time, at the very least.

In the tumor cases, the first and last ones are susceptible of a favorable interpretation. There has been sufficient trauma and there has not been too short an interval before the appearance of the growth. Both men were intelligent and noted their symptoms promptly, and one stated that his vision was normal after the blow and this was confirmed by his attending physician. This, of course, does not mean, as the fundus was not examined, that the man might not have had a beginning tumor at that time, but even if in both of these cases there was a beginning tumor, the question arises, especially from the industrial standpoint, as to whether the growth of that tumor could not have been accelerated by the blow. To that question, if asked us by the referee, we can only say, "Yes," although of course we will qualify this by stating that in any event, the tumor would sooner or later without the blow have reached its maximum effect. Both of these men, are, however, I believe, justly compensable.

The second case—that of the lumberjack struck by the belt—is quite clearly not a compensable case. The man had a tumor out of all proportion to what is possible in the length of time from the injury to the time of the observation. These cases will always claim compensation and we must be positive in our statement to the referee or court that there can be no relationship. We are called upon *only* to express our *medical judgment* and it is left to the Accident Commission or court to determine the compensability. In this compensability many factors play a rôle—the nature of employment, preëxisting physical ailments, time relations of effect and cause, questions of negligence, wilful disobedience, absence of common safety devices, etc. It is wise for those engaged in industrial surgery to familiarize themselves with the broad point of view held by most Accident Commissions—a point of view I know certainly held

by the Accident Commission of the State of California. If we report that there is a *likelihood* of relationship between the eye injury and later development of tuberculosis, syphilis, or neoplasm, other factors being equal, it will be decided in the sense that the injury was the direct cause of the disability and the patient compensated accordingly. If we decide that a latent or slight active process in the eye was accelerated or caused to appear active before it otherwise would have done so, compensation is awarded accordingly. If we are absolutely positive that the injury sustained could not in any way have caused the later appearance of tuberculosis, syphilis, or neoplasm, we must state so. We must state so without equivocation, for it is only then that the employer or insurance carrier is given an equal consideration with the employee. The viewpoint is that ordinarily an employer must compensate his injured employee for the entire disability caused by accident, regardless of the effect of poor physical condition of such employee aggravating or complicating the condition. *An employer must take his employees as he finds* them. An exception to this has been made by the Commission of the State of California, however, in 1915. In cases where the duration of the process is unduly prolonged by syphilis, tuberculosis, or chronic varicose ulcers, compensation will be awarded only for the longest period of disability for which a normal person sustaining the same accident would reasonably be disabled. The above seems quite just, for there must be *some* limit when the greater part of the disability is due to the disease and not to the accident.

The appended literature includes only the more important articles, and only those of fairly recent date.

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9. Reports of the Industrial Accident Commission of the State of California, 1914–1920.

THE OCULAR MANIFESTATIONS OF MULTIPLE SCLEROSIS.[1]

By Dr. WARD A. HOLDEN, New York.

PUPILLARY anomalies in multiple sclerosis are rare. Palsies of the ocular muscles are found in but 20% of the cases, are of nuclear origin, are frequently transitory and have no features that are characteristic. Nystagmus or nystagmoid twitching is found in almost all advanced cases.

Our particular interest, then, lies in the consideration of the less easily interpreted optic nerve symptoms, which are of importance, first, in assisting in the diagnosis of multiple sclerosis and, second, in enabling us to make a prognosis that will relieve the patient of the fear of impending blindness. The optic nerve symptoms of multiple sclerosis have long been known and the chief advance in our knowledge of them, recently, has been in the greater precision in determining the defects in the visual field and in the earlier recognition that the symptoms are dependent upon the disseminated disease of the central nervous system.

A paper I read in 1908 on the subject before a joint session of the ophthalmological and neurological sections of the American Medical Association (*Journal of the A. M. A.*, li., No. 2) was illustrated with drawings of the disks and with charts of the corresponding fields in the different types of visual disturbance, and also with photomicrographs showing degeneration of the axial portions of the optic nerves in a case with central scotomata. At that time the ophthalmologist on finding a central scotoma was sometimes content to make a diagnosis of retrobulbar neuritis without going very deeply into its

[1] Read at the second annual meeting of the Association for Research in Nervous and Mental Diseases, New York City, December 28, 1921.

ætiology. The purpose of that paper was to show that a central scotoma of rapid onset, if one could exclude poisoning by chemicals, diabetes, retinal lesions and hysteria, meant as a rule one of two things—either pressure upon the optic nerve from retained secretion in the paranasal sinuses, or multiple sclerosis. A negative rhinological examination, with radiographs of the sinuses, will exclude the sinus origin of central scotoma except in the rare cases in which sclerotic conditions of the sinuses may underlie the trouble. In some of these latter conditions exposure and aëration of sinuses without retained secretion have been followed by improvement in vision, perhaps as exposure of the dura mater in epilepsy is sometimes followed by lessening of the attacks. After exclusion of the sinuses and the other factors mentioned, it is justifiable to make a diagnosis of multiple sclerosis if one or more additional symptoms of that disease can be elicited. But since the visual disturbances are sometimes the earliest symptoms to appear the ophthalmologist whom the patient consults may be puzzled and the neurologist's later examination will not always confirm his tentative diagnosis.

One of the most important of recent papers on the subject is that by Klingmann (*Journal of Nervous and Mental Disease*, 1910, No. 12). He gives in detail the histories of twelve patients with unquestionable multiple sclerosis in which visual disturbances were noted early. The most illuminating and novel feature of his paper is the record of the visual fields. His fields taken carefully with very small test objects show in many cases small absolute multiple scotomata in or near the point of fixation and rather more numerous in the temporal than in the nasal portion of the field. With his small test objects he found as many as sixteen minute *absolute* scotomata in cases in which earlier examiners might have noted only a single large diffuse *relative* scotoma. The tendency to-day is to use small test objects and thus obtain more accurate fields.

The symptoms on which Klingmann insists as corroborative of the diagnosis of multiple sclerosis when a central scotoma is found are ankle clonus and the Babinski toe reflex. It is surprising that in no case history does he mention the state of the abdominal reflexes. Yet diminished abdominal reflexes are found in multiple sclerosis as frequently as the Babinski reflex,

namely, in about 80% of cases. And we now have learned that if the other common causes of central scotoma can be eliminated, diminution of abdominal reflexes warrants us in diagnosing multiple sclerosis, even if no other symptoms are present. And often no other symptoms appear for years. It is understood that we exclude the diminution of abdominal reflexes that may be found with hysterial anæsthesia.

The Optic Nerve Changes.—The characteristic plaques develop in the optic nerve or tract at any point, but with great frequency in the axial fiber-bundle of the optic nerve. The axones from the ganglion cells in the macular region of the retina—the center of distinct vision—run in the temporal portion of the optic disk and further back in their course reach the center of the optic nerve to form the so-called axial bundle. This is a sensitive bundle which is particularly affected by toxic agents and by diffuse pressure upon the optic nerve.

In the plaque the inflammatory exudation at first merely compresses the optic nerve fibers and interferes with their function. Later the medullary sheaths break down and the glia tissue proliferates, but since the axis cylinders are not destroyed, restitution of vision frequently takes place. In the beginning if the inflammatory plaque lies near the optic disk, there may be congestion or a low degree of œdema of the disk, but if the plaque lies far back in the nerve the disk for a time appears normal. However, after an interval, ranging from one to six weeks, pallor of the disk usually appears and remains permanently, even though vision is restored to normal again.

The pallor of the disk varies with the extent and location of the plaques and for descriptive purposes it has been classified as of three varieties: (*a*) a pronounced whiteness of the disk in its entire extent; (*b*) a slight pallor of the disk in its entire extent and (*c*) a pallor of the infero-temporal third of the disk with the other two thirds normal in color.

The first and second varieties—diffuse pallor—are found also in tabic and other general atrophies, while the third—temporal pallor—indicates an involvement of the axial or papillo-macular bundle alone. This is the variety of pallor frequently found in multiple sclerosis and it is, to a certain degree, characteristic of this disease.

In some cases there is considerable difficulty in interpreting

pallor of the optic disk. In health its temporal half is always paler than its nasal half and occasionally in healthy persons with normal vision one disk is distinctly paler than the other. Furthermore, in some cases of multiple sclerosis pallor of the temporal half of the disk is found while acuteness and field of vision are still normal. This suggests either that there may have been a slight involvement of the nerve which had not yet disturbed its function, or, that there may have been earlier disturbances in the field of vision of which the patient had not been conscious and from which recovery had taken place. The appearance of the optic disk, therefore, has less diagnostic significance than the acuteness and the fields of vision.

The Fields of Vision.—The defective fields in multiple sclerosis are of three types: (*a*) peripheral contraction; (*b*) central or paracentral scotoma, and (*c*) a combination of both peripheral and central defects. Many observers find peripheral contractions with considerable frequency, but it is quite certain that in a number of these cases the defect is of functional rather than of organic nature. We have been accustomed to speak of a peripheral contraction, often increasing as the test continues, as a functional or fatigue field which is found in the neurasthenic or hysterical. The present day interpretation of this fatigue field is that it is suggested by the examiner to a patient susceptible of suggestion. In multiple sclerosis the mental state of the patient is often one in which suggestions are readily seized upon. Hence, while at times there may be definite constant peripheral defects in the field due to a lesion in the optic nerve, we yet view with suspicion records of a more or less uniform contraction of the entire periphery of the field and regard many of these contractions as being of a functional nature and suggested to the patient through defective technique in taking the field.

The more characteristic defects in the field are the central and paracentral scotomata. In these cases again great care must be taken in the tests which must be carried out quickly with very small test objects, for the patient soon becomes confused and his answers contradictory. When there are very small absolute and larger relative defects no two observers may obtain identical fields. In case of paracentral scotomata the patient may be aware of disturbed vision while his central

acuteness of vision is normal with the test cards, and some searching may be required to find the small defects in the field that the pallor of the disk leads us to suspect.

The combined form of peripheral contraction and central scotoma is not infrequent. Here, too, a distinction must be made between the functional and the true defects. In advanced progressive cases almost every form of field may be found, even homonymous hemianopsia.

Course and Diagnosis.—The onset of the visual disturbance is acute in half the cases and in a large percentage both eyes are affected. The maximum disturbance of vision may be reached in a few days and recovery may take place in an equal time. Again the disturbance of vision may long remain stationary, then either improve or grow worse, and remissions, relapses and extensions may alternate for years. With a central scotoma the patient cannot read, but he can go about without difficulty, and unlike atrophies of the optic nerve of other origin this variety never leads to blindness, and a reassuring prognosis may always be given.

When the visual disturbance is the first symptom noticed and a central or paracentral scotoma develops within a few days without pallor of the disk, the differential diagnosis between multiple sclerosis and hysteria is often most difficult. The patient with multiple sclerosis may exhibit hysterical manifestations and an adequate psychic trauma may be discovered. The vision may improve slowly or remain stationary, but after a lapse of weeks a pallor of the disk appears which confirms the diagnosis of organic disease.

There is no difficulty in distinguishing between the optic nerve disturbances of multiple sclerosis and those of tabes. It may be difficult, however, to distinguish between them and those of disseminated myelitis in the rare cases in which visual symptoms of myelitis precede the spinal symptoms. In my own observations of disseminated myelitis, however, the visual disturbance in half the cases conformed to the type of lateral hemianopsia in the field of one eye only, which is very rare in multiple sclerosis.

In summing up we may say that defective vision in one eye or both, generally of acute onset and mostly with one or more small scotomata at or near the point of fixation, is a common

symptom of multiple sclerosis that may come on at any time, but often appears early in the disease. A rhinological examination should exclude the paranasal sinuses as causative factors and then in many cases we must exclude hysteria. The early organic signs on which we rely for the exclusion of hysteria are diminution of the abdominal reflexes and the presence of the Babinski reflex and ankle clonus.

PRIMARY INTRANEURAL TUMORS (GLIOMAS) OF THE OPTIC NERVE.

A HISTOLOGIC STUDY OF ELEVEN CASES, INCLUDING A CASE SHOWING CYSTIC INVOLVEMENT OF THE OPTIC DISK, WITH DEMONSTRATION OF THE ORIGIN OF CYTOID BODIES OF THE RETINA AND CAVERNOUS ATROPHY OF THE OPTIC NERVE.[1]

By Dr. F. H. VERHOEFF, Boston, Mass.

(With twelve illustrations on Text-Plates VIII.–X.)

HUDSON[2] in his classical paper on primary tumors of the optic nerve concluded that the great majority of these tumors consisted essentially of neuroglia. Thus, on analyzing 154 cases collected from the literature, he found that 118 tumors were gliomatous, or not improbably gliomatous, although only twenty-eight were originally reported as of that nature. Of the thirty-five tumors that were not gliomatous, he regarded twenty-four as certainly endotheliomas, five as probably endotheliomas, and six as fibromatoses of the nerve sheath. The gliomatous tumors arose from the nerve stem and were, of course, all primarily intradural; but Hudson rightly objected to the classification of tumors of the optic nerve into intradural and extradural tumors, because tumors of entirely different nature, endotheliomas,[3] are also frequently intradural. A better classification, it seems to me, would be into tumors

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[1] From the Massachusetts Charitable Eye and Ear Infirmary.

[2] Hudson, A. C.: Primary Tumors of the Optic Nerve, *Roy. Lond. Ophth. Hosp. Rep.*, xviii., 317, 1912.

[3] This term, which is generally applied to the common tumors of the meninges, is really a misnomer, since according to embryologists the meninges are not lined by endothelium but by mesenchymal epithelium.

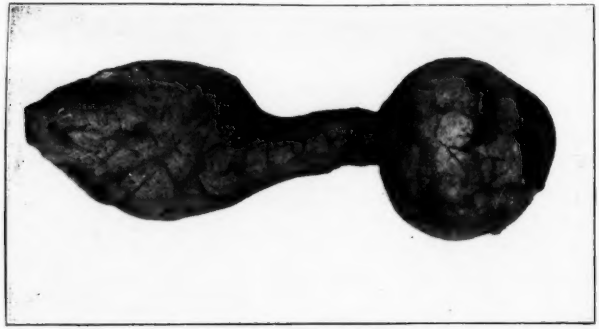

Fig. 3 (Case 3).—Glioma of Optic Nerve. Gross Specimen.

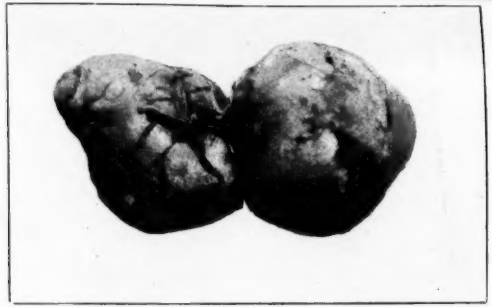

Fig. 1 (Case 1).—Glioma of Optic Nerve. Gross Specimen.

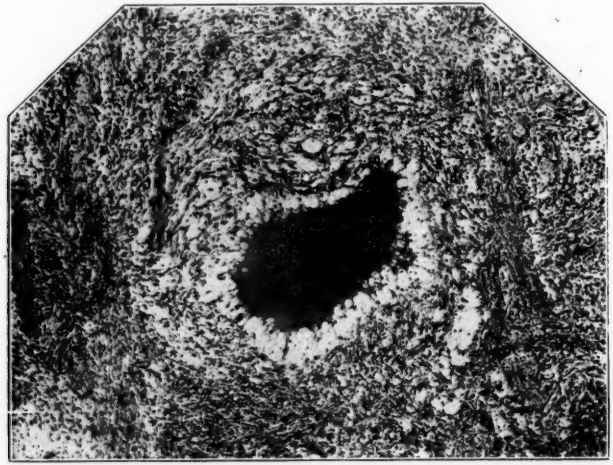

Fig. 4 (Case 1).—Glioma of Optic Nerve, Mixed Type, Showing Vacuolization of Cells and Formation of Large Cystic Space Filled with Serum. × 55.

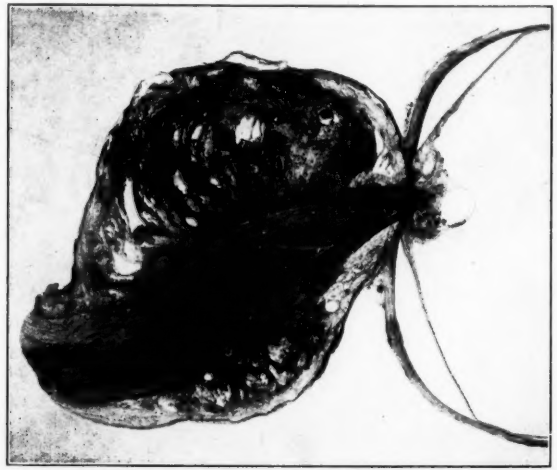

Fig. 2 (Case 2).—Glioma of Optic Nerve Showing Cystic and Gliomatous Involvement of the Optic Disk with Prepapillary Cyst. The Retinal Separation is Artefact. About

arising in the nerve stem (intraneural), and tumors arising in the nerve sheath (extraneural).

In this communication I shall confine myself to the consideration only of primary tumors of the optic nerve stem, since these tumors are evidently entirely different from those arising in its sheath.

In spite of Hudson's paper, considerable doubt still seems to remain concerning the exact nature of the primary intraneural tumors of the optic nerve, and Hudson himself did not regard them as true gliomas.

Within the last twenty years, three such tumors have been submitted to me for examination, and through the courtesy of colleagues, sections of eight other cases have been made available to me for study. Thus, having sections of eleven cases to compare directly with one another, I am enabled, perhaps, to acquire a somewhat better conception of the structure and nature of these tumors than could be obtained by the study of a single case, or by an attempt to interpret the various descriptions of the numerous isolated cases reported in the literature. One of my own cases (Case 1) I report herewith in somewhat greater detail than the others because both clinically and histologically it showed features not hitherto observed, and other features, I believe, hitherto not correctly interpreted. For the early clinical data of this case I am indebted to Dr. J. W. Cahill, who referred the patient to me. For the privilege of reporting the clinical features of Case 2, I am indebted to Dr. Alexander Quackenboss. For the sections or tissues from cases 4, 5, 6, 9, and 10, I am indebted to Drs. de Schweinitz, E. F. Krug, James Ewing, Louise Meeker, E. C. Ellet, M. Cohen, and R. G. Reese. The last four cases have been reported elsewhere, with brief histologic descriptions, which, as will be seen, are somewhat at variance with my own interpretation of the tumors.

CASE 1.—*Glioma of the optic nerve, mixed coarsely reticulated and spindle-cell type. Gliomatous involvement of the optic disk and retina, with formation of large prepapillary cyst. Normal vision up to four years previous to operation.*

History.—J. R., boy, was 14 years old at the time of operation. His father, mother, and their seven children had normal eyes. There was no relationship between the parents,

and no congenital anomalies in any of the children. The Wassermann test of both parents was negative. The patient had never had any known injury to the head. He had measles at 5 years, otherwise he had had no infectious diseases. At the age of 8, 9, and 10, school tests showed normal vision in both eyes.

At the age of 11, the patient noticed that he could not see to shoot his air rifle as formerly. Six months later, a school test showed no vision in the right eye. Soon afterward, December 12, 1916, he was brought to Dr. Cahill, who found the right eye practically blind and showing papillœdema of about 4 diopters. August 28, 1917, at the age of 12, he was referred to me by Dr. Cahill and was admitted under my charge to the Massachusetts Charitable Eye and Ear Infirmary. At this time, there was slight exophthalmos of the right eye, and papillœdema of about 5 diopters. Vision of the eye was reduced to light perception with faulty projection. The general physical examination was negative except for very slight glandular enlargement—cervical right axillary and epitrochlear. Roentgenograms of the orbit, sinuses, and sella turcica revealed nothing abnormal, and a Wassermann test was negative. A probable diagnosis of tumor of the optic nerve or orbit was made, but operation was refused.

August 30, 1919, at the age of 14, he was again referred to me by Dr. Cahill and again admitted to the hospital. There was now moderate exophthalmos of the right eye, outward and downward, and limitation of motion outward and upward. The lids could be easily closed. There was no congestion of the globe or conjunctiva. The globe could be pushed back into the orbit, but no tumor mass could be felt on palpation of the surrounding tissue. A roentgenologic examination yielded negative results. The vision of the eye was nil.

On ophthalmoscopic examination, there was seen at the site of the disk and extending about 9 diopters into the vitreous, a sharply defined globular mass, grayish in color, over which the retinal vessels coursed. On its surface were reddish areas indicating that the tumor was really a cyst through which a red reflex could be seen in places. There were also small hemorrhages on its surface which extended into the vitreous. The latter also contained numerous web-like opacities. Around the macula there were numerous white spots, the largest having a diameter about twice that of a large retinal vein, situated beneath the vessels. Near the macula was a small round spot faintly mottled with pigment. The fundus was otherwise normal except for a slight stippling somewhat suggestive of hereditary syphilis.

ILLUSTRATING DR. F. H. VERHOEFF'S ARTICLE ON "PRIMARY INTRANEURAL TUMORS (GLIOMAS) OF THE OPTIC NERVE."

FIG. 5 (Case 2).—Glioma of Optic Nerve, Spindle-Cell Type, Showing Neuroglia Fibrils Stained Differentially. × 180.

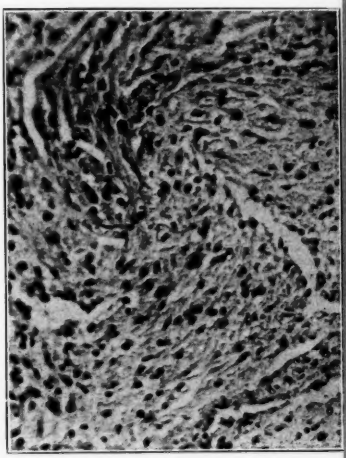

FIG. 7 (Case 6).—Paraffin Section of Glioma of Optic Nerve, Finely Reticulated Type, Showing Vacuolated and Reticulated Structure. × 150.

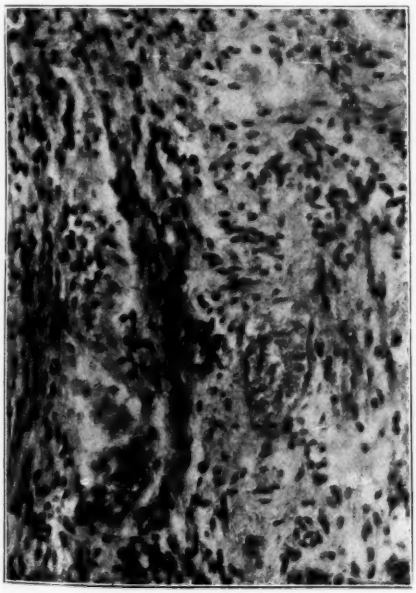

FIG. 6 (Case 4).—Glioma of Hypophysis Cerebri. Neuroglia Fibrils are Abundant but do not Show Well in the Photograph. Vacuolization of the Cells and Formation of Cystic Spaces are Well Marked. × 200.

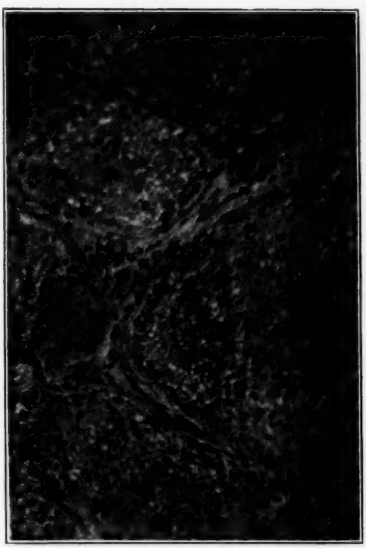

FIG. 8 (Case 8).—Celloidin Section of Optic Nerve; Vacuolization of the Cells Well Marked. × 150.

The left eye was normal and had normal vision.

September 12, 1919, under ether, the right eye, with the large tumor attached, was removed.

The socket was subsequently treated with radium. In spite of the large size of the tumor which had been removed, the artificial eye ultimately worn by the patient did not appear more deeply set than the left eye.

PATHOLOGIC EXAMINATION.

Macroscopic Examination (3980).—The specimen consists of the globe with the tumor attached. The latter is roughly ovoid in shape (Fig. 1), extends from the globe backward *24mm*, and measures *2cm* in its greatest cross diameter. At its connection with the globe, it is constricted to *3mm* in diameter, while its posterior cut end is *6mm* thick.

The optic disk is replaced by a nodule, *5.5mm* in its greatest cross diameter and *4.5mm* high, which slightly involves the retina. Within its summit is a cyst *2.5mm* in diameter. Around the nodule, the retina shows several slight separations. The globe otherwise appears normal.

On section, the extraocular portion of the tumor is found to be entirely within the dura, the latter forming a capsule for it. At the lamina cribrosa the nerve stem is *2mm* in diameter. Posteriorly, it then gradually enlarges until it attains a diameter of *12mm*, after which it gradually narrows again. From the periphery of the nerve, most noticeably at the thickest portion on one side, an exuberant growth of tissue has taken place which has distended the subdural space in ampulliform fashion and which now forms the main mass of the tumor. At the cut end of the tumor, this tissue is almost absent, so that the tumor here consists almost entirely of the thickened nerve stem.

Microscopic Examination (Fixation of large piece of the tumor in Zenker's solution, the globe with tumor attached, in 10 per cent. liquor formaldehydi containing 38 per cent. alcohol, for forty-eight hours, followed by immersion in acid alcohol for twenty-four hours. Celloidin sections were made along the axis of the optic nerve and through the middle of the tumor. Staining in hematoxylin and eosin, Mallory's connective tissue and neuroglia stains, and Verhoeff's elastic tissue stain).

The optic nerve fibers are atrophic throughout, their myelin sheaths failing to stain. The lamina cribrosa is curved backward and thickened, owing chiefly to increase in its spindle cells. Just behind the lamina cribrosa, the nerve fibers have been replaced by neuroglia just as in a case of advanced glaucoma. The glia cells are thickly set, irregu-

larly arranged, and have thick processes which stain strongly in eosin.

Farther back, the structure of a normal nerve is to a great extent maintained, the enlargement of the nerve stem being due to a great increase in its neuroglia within the interseptal spaces. The neuroglia here consists of a finely fibrillated matrix, the fibrils running predominantly in a longitudinal direction. Embedded in this are cells usually with long oval nuclei and a small amount of feebly staining cytoplasm, which is often vacuolated. The cells freely communicate with one another by delicate processes, thus forming a syncytium. Many of the cells are abnormally large and some are multinucleated. A few of the cells contain hematogenous pigment. For a considerable distance, the fibrous septums maintain a normal arrangement, simply becoming more widely separated as the nerve expands.

The pia has been destroyed everywhere or rendered unrecognizable. Near the globe, the subdural space is distended by coarsely reticulated hyaline tissue, which has evidently resulted from proliferation of so-called endothelial cells of the arachnoid. Posteriorly, this tissue intermingles with the tumor tissue.

The growth within the subdural space in general appearance differs greatly from that within the nerve stem, but, nevertheless, shows some resemblance to it. The cells are still generally arranged in more or less definite bundles, but the latter do not run in any one general direction, as they do in the nerve stem, and the cells have longer and thicker processes. The nuclei are usually large and oval in shape. Where the arrangement into bundles is most definite, the cells are spindle-shaped. Throughout the tissue, especially between the bundles, there are numerous irregular spaces of various sizes, often giving an appearance closely resembling that seen in cavernous atrophy of the optic nerve. While most of these spaces are microscopic in size, some are actual cysts and reach a diameter of *2mm.* The smaller spaces are either apparently empty or filled with dilute serum. Some of the larger spaces contain serum alone (Fig. 4), others, in addition, contain a small amount of fibrin, a few blood corpuscles, and free large round or stellate cells. These cells appear to be neuroglia cells derived from the cells bordering the spaces.

The smallest of the spaces can be seen to be vacuoles situated within the cytoplasm of the glia cells. Some of these cells contain each a single vacuole, but more often each cell is distended with numerous vacuoles. As in these situations, the cells are more or less stellate in form and connected with one another by their processes, the structure may be de-

ILLUSTRATING DR. F. H. VERHOEFF'S ARTICLE ON "PRIMARY INTRANEURAL TUMORS (GLIOMAS) OF THE OPTIC NERVE."

For the drawings (FIGS. 9 to 12) I am indebted to Dr. H. H. Vail.
Unless otherwise stated, the staining is in hematoxylin and eosin.

FIG. 9 (Case 1).—Glioma of Optic Nerve, Showing Neuroglia Fibrils Stained Differentially, and Spindle Cells.

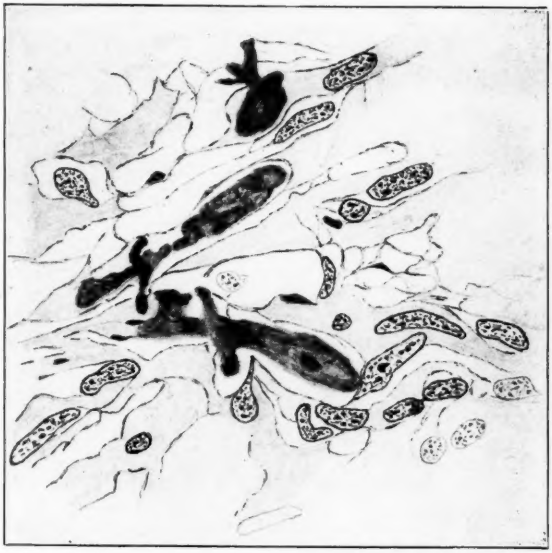

FIG. 10 (Case 1).—Glioma of Optic Nerve, Showing Cytoid Bodies and Vacuolated Syncytium.

FIG. 11 (Case 1).—Cytoid Bodies and Fibrils, Stained in Phosphotungstic Acid Hematoxylin.

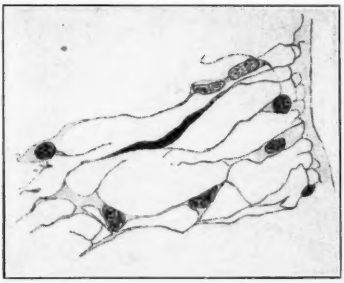

FIG. 12 (Case 1).—Formation of Cytoid Body in Neuroglia Syncytium within the Retina.

scribed as a reticulated or vacuolated syncytium of neuroglia. All of the other spaces, including the cysts, have evidently resulted from smaller spaces breaking into each other.

The connective tissue stroma, as revealed by Mallory's anilin blue stain, is for the most part limited to a small amount accompanying the blood vessels. At the periphery, however, it is fairly abundant, the dura here sending numerous trabeculæ into the tumor. The appearance of regularly arranged fibrous septums such as are seen in the nerve stem, is in the main body of the tumor almost entirely lacking. Elastic fibrils are present only within the connective tissue stroma and in the walls of the blood vessels. The stroma is often involved by the neuroglia of the tumor, the involving tissue then assuming the spindle-cell type. The tumor is poorly vascularized but shows no areas of necrosis. It is practically free from chronic inflammatory infiltration, although in some places there is slight infiltration with lymphoid cells. Along the dura, there are numerous corpora aranacea, most of them calcified.

The optic disk is entirely replaced by an overgrowth of neuroglia, which also involves the retina for a short distance, from 1 to 3*mm* around it. This tissue displays in general the same structure as that of the subdural growth, the reticulated or vacuolated structure being especially well marked. At the summit of the disk the neuroglia has proliferated into the vitreous body (Fig. 2), forming a polypoid nodule; and it is within this nodule that the large cyst seen ophthalmoscopically occurs. This cyst is identical in appearance with the smaller cysts in the body of the tumor and has evidently been produced in the same way. It measures 2.5*mm* in diameter and contains dilute serum and a small amount of fibrin. At the margin of the nodule there is a similar cyst about 1.25*mm* in diameter. Within the nodule, the vessels are greatly congested, and there are groups of actively proliferating capillaries. In the wall of the larger cyst, there are small blood extravasations. These conditions are no doubt due to venous stasis.

The retinal involvement on one side of the nodule differs markedly from the rest of the tumor. Only the nerve-fiber layer is affected. This gradually becomes thickened as the nodule is approached, until it is about three times its normal thickness. This thickening is not due to extension of the tumor into the retina, but to proliferation of the preëxisting neuroglia. Müller's fibers have increased in size and number and preserve their vertical arrangement, while the other glia elements have also greatly increased.

On the opposite side of the nodule, the nerve-fiber layer is thickened in the same way but to a less degree, and here an

exuberant growth of neuroglia has taken place beneath the retina. Within this tissue, the smaller cyst, noted above, occurs, and there are also a few large islands of cells, evidently derived from the pigment epithelium, some of which contain autochthonous pigment. Some of these islands have become converted into colloid material similar to that in colloid excrescences of the choroid.

Extending from this tissue, for a distance of about 3*mm* between the pigment epithelium and rods and cones, and in places completely destroying the latter, is a thin layer of neuroglia in which the cells are mostly spindle-shaped. In some sections, this layer appears discontinuous so that the appearance is produced of localized areas of neuroglia which replace the layer of rods and cones or contract it so as to form pseudorosettes. No doubt these were the white spots seen ophthalmoscopically. Aside from these changes, the retina is everywhere normal except for complete atrophy of its ganglion cells.

The vitreous humor contains a moderate amount of serum, and near the tumor, a slight amount of fibrin and many epithelioid cells with stellate processes. The other ocular structures are normal. Cytoid bodies (Figs. 10 and 11) are extremely numerous in the subdural growth and optic disk tumor, but are scanty in the nerve stem. A few are present in the retina. (See below.)

Differential Neuroglia Stain.—In general, the tumor shows only moderate tendency toward the production of differentiated neuroglia fibrils. In the nerve stem, they appear to be practically absent except in the vicinity of the lamina cribrosa, where they are fairly abundant. It is possible, however, that after the method of fixation employed for this portion of the tumor, very fine neuroglia fibrils may fail to stain differentially. In the subdural portion of the tumor, at least a few fibrils can be found in every field. They are abundant near the periphery, and wherever the cells are spindle-shaped and closely packed together (Fig. 9). They are also abundant in the tumor of the optic disk. Under high magnification, the stainable substance in the fibrils often appears granular. In some instances, a fibril stains for a short distance, then becomes almost colorless, then stains again. In the thickened portion of the retina, the glia fibrils stain strongly, and are unusually large in caliber and length. The differentiated fibers are, in fact, more abundant here than anywhere in the growth, and tend to maintain a normal arrangement.

CASE 2.—*Glioma of optic nerve, spindle-cell type. Death from meningitis following operation.*

History.—J. O'G., boy, aged 4 years, admitted to the Massachusetts Charitable Eye and Ear Infirmary, January 13, 1915, under the care of Dr. Quackenboss, with a history of protrusion of the left eye which had been noted by his parents for two years, presented no history of trauma. The general examination was negative.

February 20, 1915, the globe and tumor were removed intact. February 21st, the temperature was 103 F. February 22d, the patient showed symptoms of meningitis; stiff neck, Kernig's and Babinski's signs. February 23d, the patient died. Necropsy was not permitted.

PATHOLOGIC EXAMINATION.

The tumor (2700, Fig. 3), which is entirely intradural, is ovoid in shape and begins at a point 12*mm* behind the globe and extends backward 34*mm*. Its greatest cross diameter measures 21*mm*. At its posterior cut end, the nerve returns almost to normal size, being here 3.75*mm* in diameter. Between the globe and the tumor, the nerve stem is only 2*mm* in thickness. The subdural space is here greatly distended with fluid and partly filled up with proliferated arachnoid tissue, which has been invaded by the tumor from behind. On section, the tumor is found to consist primarily of an enlargement of the nerve stem. The latter reaching a thickness of 12*mm*. At its thickest portion, the tumor has broken through the pia and greatly distended the subdural space in all directions.

In the relatively normal portion of the nerve, special staining shows persistence of a considerable number of medullated nerve fibers. Beginning at the globe, the nerve stem shows marked increase in its neuroglia cells, many of the new cells being spindle-shaped. As the nerve is followed backward, the spindle cells increase in number until the nerve passes insensibly into the tumor proper. As the spindle cells increase in number, coarse neuroglia fibrils begin to appear between them, and the nuclei of the cells become less uniform in size. In the tumor itself, almost all of the cells are spindle-shaped and are arranged in more or less definite bundles running in various directions, so that the appearance of a spindle-cell sarcoma is closely simulated. Between the bundles are numerous nucleated strands staining deeply in eosin, which in hematoxylin and eosin specimens at first glance appear to consist solely of fibrous septums. The differential neuroglia stain, however, show that these strands consist chiefly of coarse neuroglia fibrils and their accompanying spindle cells, running along and within delicate connective tissue septums (Fig. 5). These strands are

present throughout the tumor but are largest and most numerous in the intervaginal portion of the growth. The less definite bundles between the strands also contain numerous neuroglia fibrils, but here they are finer in caliber. Vacuolization of the cells is not a conspicuous feature of the growth, but in a few places, especially in the intervaginal portion, it is well marked and has led to the formation of a few small cystic cavities. The connective tissue stroma, as brought out by Mallory's connective tissue stain, consists of delicate septums which are accompanied and invaded by the tumor cells as just described. The blood vessels are small and few in number. Elastic tissue is present only in the stroma. Cytoid bodies are abundant and are most numerous in the strands containing coarse neroglia fibrils. The optic disk is not cupped or elevated. Its normal structure has been entirely replaced by neuroglia. The cells of the latter are small in size, thickly set, irregularly arranged, and show marked vacuolization. The retinal ganglion cells have completely disappeared in the macular region, but an occasional one can be recognized elsewhere. Otherwise the globe is normal.

CASE 3.—*Glioma of optic nerve, mixed, finely reticulated and spindle-cell type.*

History.—F. L., boy, aged 7, was admitted to the Massachusetts Charitable Eye and Ear Infirmary, March 15, 1894, with a history of exophthalmos of three years' duration, left eye. Ophthalmoscopic examination showed papillœdema and tortuosity of retinal veins. The globe, with a large tumor of the optic nerve, was removed, at least half of the tumor being left in the orbit.

PATHOLOGIC EXAMINATION.[1]

(2629). The globe is normal with the exception of slight papillœdema and atrophy of the retinal ganglion cells. The tumor of the nerve begins 6*mm* behind the globe and rapidly reaches a cross diameter of 24*mm*. The nerve itself reaches a diameter of 12*mm*. The subdural space is distended with the tumor growth except anteriorly, where it is filled with tissue resulting from proliferation of the arachnoid. Weigert's preparation shows complete atrophy of nerve fibers of optic nerve. Histologically, the intraneural portion of the growth is so remarkably similar to that of Case 8 that a separate description of it is unnecessary. Between the tumor and the globe the nerve shows simple atrophy without gliosis,

[1] The specimen was not submitted to me for examination until 1915.

except posteriorly, where its neuroglia by gradual transition assumes the character of the tumor. The intervaginal portion is so similar to that of Case 2, that the same description may be applied to either. Vacuolization of the cells is well marked, there are numerous small cysts, and cytoid bodies are abundant in places.

CASE 4.—*Glioma of optic nerve, finely reticulated type, associated with glioma of the hypophysis.*[1] The following clinical data were obtained from Dr. de Schweinitz's very full notes on this case: A boy, 12 years old at the time of operation, presented nothing of importance in his family history, but when he was between his third and fourth years he had suffered from convulsions; one convulsion also occurred in his sixth year. Exophthalmos was first noted when the child was about 5 years of age, and gradually increased, with progressive atrophy of the optic nerve without preceding neuritis or choking of the disk. Roentgen-ray examination indicated absorption of bone or bulging of the walls of the orbit outward, but nothing else.

A general physical examination made by Dr. Stengel, July 11, 1908, showed overdistention of the veins of the neck, decided enlargement of the heart, without evidence of valvular disease, indications of pericardial adhesions, and some congestive enlargement of the liver.

At the age of 8, the vision of the right eye was $\frac{6}{60}$, and there was a large complete central scotoma. At the age of 10, the vision was $\frac{6}{6}\frac{5}{0}$.

At the time of operation, June, 1911, vision was reduced to light perception, the eyeball was displaced forward and downward, and Hertel's instrument recorded 30*mm.*

At operation, a neoplasm, not unlike the shape of the eyeball itself, was found growing from the optic nerve, with a

[1] A brief preliminary report of this case was made in 1912 by Dr. de Schweinitz (*Tr. Sec. Ophth., Coll. of Phys. and Surg., Philadelphia*, Jan. 18, 1912) before evidences of the pituitary growth had appeared. Through some fault in technic, the sections made of the tumor were stained so poorly and the tissue elements were so shrunken that Dr. de Schweinitz decided not to give a further report of the case and the specimens were mislaid. He was able, however, to find one large section of the tumor of the nerve which he kindly sent me, and from which I was readily able to make out the details described above and arrive at a positive diagnosis. He also kindly sent me sections of the tumor of the pituitary body which had been sent him from the hospital where the second operation was performed. I desire here to thank Dr. de Schweinitz for his extreme courtesy in permitting me to report the clinical features and my pathologic findings in this highly unusual case.

small portion of uninvolved nerve between the anterior part of the growth and the posterior portion of the eyeball. The growth was dark red, entirely encapsulated, 3.5*cm* in length, 2.5*cm* in width and 3*cm* in depth. On section, it was seen that the tumor proceeded from the nerve in a fan-shaped area and was entirely covered by a dural capsule. It was composed, in general terms, of a connective tissue, through which were scattered numerous nuclei, together with swollen and œdematous nerve fibrils. In some of the sections, cells suggesting ganglion cells were present.[1]

When seen in 1916, four years after operation, there was no recurrence of the tumor in the socket, but the boy had grown very tall and slender. Since he showed symptoms of intracranial involvement, he was placed under the care of a brain surgeon in Philadelphia. In 1917, he went to a hospital in another city, and the following note on the case was sent to Dr. de Schweinitz:

"When we saw him he had a moderate grade of choked disk, with upper temporal restriction of the color fields. A suprasellar exploration was made and revealed an hypophyseal tumor, apparently without any direct continuation along the nerve sheath, which extended up into the third ventricle sufficiently far to produce an obstructive hydrocephalus. Portions of the tumor and of the right optic nerve were removed. The former is an hypophyseal struma made up largely of colloid material,[2] while the optic nerve shows a gliomatous infiltration. It was thought impossible to radically remove the tumor. Only a decompression was done, the effect of which on the visual fields has not as yet been determined."

Shortly afterward, the patient died.

Microscopic Examination.—The section of the optic nerve tumor includes a portion of normal optic nerve and the largest part of the growth. The tumor has not broken through the pia, so far as can be determined from this one section. In structure, it is extremely simple and uniform throughout. It consists essentially of small cells with small round nuclei, which form a finely reticulated and vacuolated syncytium. The vacuolization, which is extremely marked, is rendered unduly conspicuous by the shrinkage resulting from the method of preparation. The transition of the normal nerve into the tumor is gradual. In fact, the tumor differs in structure from the neuroglia of a normal optic

[1] The only structures that I find in the tumor that might be mistaken for ganglion cells are cytoid bodies.

[2] In my opinion, this was undoubtedly serum, sometimes containing fibrin.

nerve chiefly in that it is much more highly reticulated and vacuolated. It contains numerous small cysts filled with serum. Cytoid bodies are extremely numerous, and are brought out with unusual distinctness by the method of preparation.

In many places, the tumor is almost identical in structure with the intraneural portion of Case 8 (Fig. 8).

Tumor of the Hypophysis.—This is, in general, composed of cells which are highly vacuolated and form a reticulated syncytium. As a result of the extreme vacuolization, numerous irregular cystic spaces filled with serum have been formed. The nuclei of the cells are usually round or slightly oval. Running through the tumor are numerous bundles of spindle cells accompanied by coarse fibrils, many of which are spiral in form, and which stain deeply in eosin and are easily recognized as neuroglia fibrils (Fig. 6). Numerous finer fibrils are also seen between the other tumor cells. The cells show a decided tendency to arrange themselves radially to the blood vessels. Typical cytoid bodies are occasionally seen in the tumor. The structure does not suggest that of a normal optic nerve, but does strongly suggest a derivation from the pars nervosa of the hypophysis. The tumor nowhere contains cells similar to those of the pars anterior of the hypophysis.

One section, labeled "optic nerve," shows at one end a small bit of normal nerve tissue, removed either from the optic nerve or optic chiasm. At the other end, it shows tissue consisting of a delicate reticulated syncytium, which, allowing for the difference in methods of preparation, is identical in appearance with portions of the orbital tumor. It, however, is free from cysts and cytoid bodies.

This tissue has invaded a structure, which, judging by the presence within it of numerous coarse longitudinal fibrils, is the stalk of the pituitary body, and here has taken on the character displayed by the pituitary growth.

CASE 5.—*Glioma of optic nerve, mixed coarsely reticulated and spindle-cell type. Removal of tumor without globe, followed by retinitis proliferans* (case of Dr. Krug's, not previously reported.)[1]

History.—A girl, aged 19, had exophthalmos and disturbed motility of the eye. The eye was blind. A tumor of the optic nerve was removed by a modified Krönlein operation, without the globe, September, 1913. The globe later showed choroidal changes and retinitis proliferans. About

[1] A section of the tumor was sent to me by Dr. James Ewing, and several sections of the globe were furnished me by Dr. Louise Meeker.

five years after removal of the tumor, it showed increase of tension and signs of iridocyclitis, and was removed on account of pain.

Microscopic Examination of the Tumor.—The section does not include a portion of the uninvolved nerve, and is not cut in such a way as to show the general topography of the tumor. The latter consists of two types of tissue which are intimately intermingled. One type consists of spindle cells with coarse fibrils running between them; the other of a coarse cell reticulum containing numerous irregular spaces. The spindle-cell type is occasionally arranged in fairly definite bundles, but more often occurs in irregular masses which undergo abrupt transition into the second type of tissue. No large cysts have been found in the tumor, and cytoid bodies are few in number, although present.

Microscopic Examination of the Globe.—The cornea is normal. The anterior chamber is not obliterated and contains serous coagulum. The iris shows marked fibrosis and ectropion uveæ, the pigment epithelium on one side extending over the anterior surface almost to the root of the iris. There is peripheral anterior synechia on both sides. The pupil is free from membrane, and there are no evidences of posterior synechiæ. The lens is in situ and not highly cataractous. The retina is almost completely separated, but not applied to the back of the lens. Arising from both sides from just behind the ciliary processes to the ora serrata is a massive cyclitic membrane of loose texture which extends over the surface of the separated retina and into the folds of the latter. Posteriorly, it becomes densely fibrous and shows marked ossification. The cyclitic membrane also contains numerous hemorrhagic extravasations, some of which are undergoing organization. At the fundus, the retina is still adherent to the choroid in one place, and by traction has caused a slight separation of the choroid. The ciliary body and the anterior choroid are also slightly separated from the sclera by traction of the cyclitic membrane. The retina shows the hyperplasia usual under such conditions, and in addition, marked pigmentation with autochthonous pigment.

The choroid has taken on an abnormally fibrous structure, but does not show extreme atrophy. The optic nerve and disk are not included in the sections. Owing to the absence of posterior synechiæ and pupillary membrane, it is unlikely that iridocyclitis was the primary pathologic condition in the eye. The picture is consistent with a condition of retinitis proliferans which has caused separation of the retina and degenerative changes leading to a secondary cyclitis.

CASE 6.—*Glioma of optic nerve, chiefly finely reticulated type*, (case of Dr. Krug's, not previously reported).[1]

History.—A girl, aged 15, had exophthalmos of the left eye. The eye was blind. A large tumor of the optic nerve was removed without the globe by the Krönlein operation. One year later, the globe showed extensive pigmentary degeneration of retina and choroid.

Microscopic Examination.—Both celloidin and paraffin sections were available for study, the latter being exceedingly thin. One paraffin section, I removed from the slide and restained for neuroglia. Although the fixation was in liquor formaldehydi, by overstaining in Verhoeff's elastic tissue stain and then staining in phosphotungstic hematoxylin, I obtained satisfactory differentiation of the neuroglia fibrils.

The sections do not give an idea of the general topography of the tumor, and do not include any portion of the uninvolved nerve. The tumor is made up of two types of neuroglia. The first type, which greatly predominates, consists of a finely reticulated neuroglia syncytium containing irregular spaces, each of the largest of which is in width about three times the diameter of a large nucleus (Fig. 7). The nuclei vary considerably in size, and are round, oval, or sometimes slightly triangular in shape. Each is immediately surrounded by more or less cytoplasm, which sends out communications to the other cells, so that the characteristic appearance of so-called spider cells is produced. Often one or more minute vacuoles occur in the cytoplasm near the nucleus, and transition stages from these to the large spaces in the syncytium can be made out. It is evident, therefore, that the larger spaces have resulted from the enlargement and breaking into one another of the smaller definite vacuoles within the cytoplasm, while the syncytial reticulum is simply the thinned out cytoplasm and cell membranes remaining around the large vacuoles. In the section stained differentially, fine neuroglia fibrils can occasionally be seen running along the trabecula of the syncytium. With more suitable fixation, these would no doubt appear more abundant. The other type of tissue consists of so-called spindle cells with coarse neuroglia fibrils running between them. This tissue generally occurs in the form of bundles along and within the connective tissue septums, dividing the first type of tissue into more or less definite lobules. The bundles also occur, however, without any relation to the stroma. When this is the case, the transition of one type of tissue into the other is especially apparent.

[1] Numerous sections of the tumor were furnished me by Dr. Louise Meeker.

In places, the spindle cells are arranged radially to the connective tissue septums. The stroma, as revealed by van Gieson's stain, in the central portion consists of very delicate septums, but toward the periphery becomes denser and more abundant. The blood vessels are small and few in number.

The reticulated structure of the first type of tissue is shown much more plainly in the paraffin sections than in the celloidin sections, owing to the shrinkage incident to the preparation of the former, and to the greater thickness of the latter. The tumor contains no cysts or cytoid bodies.

CASE 7.—*Glioma of optic nerve, unusually large, mixed type.*

The section of this case was given out as a class specimen by Dr. Wintersteiner in 1902. His diagnosis was gliosarcoma. I am unable to ascertain whether or not he reported this case, and I have no clinical data in regard to it.

Microscopic Examination.—The tumor is unusually large, measuring 24*mm* by 36*mm* in cross-section. Owing probably to the large size of the tumor, the original nerve stem can no longer be definitely recognized. The central portion of the growth, however, is essentially similar to the intraneural portion of Case 8, consisting of a vacuolated and reticulated cell syncytium with small round nuclei. In this case, however, the vacuolization is more marked, and the spaces in general are larger. The delicate trabeculæ around the spaces often show fine granules on them which stain deeply in alum hematoxylin, and which are sometimes so abundant as to produce the appearance of threads or of fibrils. Toward the periphery, more and more of the cells become spindle-shaped and show coarse eosinophilic fibrils between them. Cysts filled with serum are numerous and large in size. One cyst measures 14*mm* by 5½*mm*. Cytoid bodies are extremely abundant, more so than in any of the other tumors. The blood vessels in the tumor are not numerous, but many of them are large, and many of the veins are markedly dilated. Some of the latter contain fibrinous thrombi. There are a number of large interstitial hemorrhages. At the periphery, the arachnoid in places has undergone marked proliferation, forming large strands and large masses of hyaline tissue. The latter have been invaded by the tumor in such a way as to produce areas not unlike those of a cylindroma. The dura in one place has been invaded by the tumor, but has nowhere been penetrated.

CASE 8.—*Glioma of the optic nerve, mixed type.*

The section, stained in hematoxylin and eosin, that I have of this case was given out as a class specimen by Dr. Salz-

man. It is evidently from the second of three tumors that he reported as myxosarcomas of the optic nerve.[1]

History.—A man, aged 46, had had defective vision of the left eye for twenty-five years, and no vision for four years, exophthalmos of nine months' duration, and optic atrophy. The tumor, which was incompletely removed without the globe, measured *2cm* in cross diameter.

Microscopic Examination.—The section at hand, stained in hematoxylin and eosin, includes a portion of the original nerve stem. Within the nerve stem, the tumor maintains the structure of the normal neuroglia of the nerve to a remarkable degree (Fig. 8). The tissue is separated into bundles as in a normal nerve. The cells, however, are more abundant, more irregular in size, have more cytoplasm about the small round nuclei, and are highly vacuolated. They also form a more easily recognized syncytium than do the cells of a normal nerve. Some of the cells are multinucleated. No fibrils can be seen in relation to the cells, owing no doubt to the method of staining, but judging by the similar tissue seen in Cases 6 and 9, stained differentially for neuroglia, such fibrils are undoubtedly present. Within the intervaginal space, the character of the tumor becomes markedly altered. In large areas, the cells here show an extreme degree of vacuolization and have in places formed fairly large cysts filled with serum. Running irregularly through this portion of the tumor are numerous large bundles of spindle cells, accompanied by coarse fibrils. Judging by the similar bundles in Case 1, these are undoubtedly neuroglia fibrils. In places, there are large areas consisting almost exclusively of spindle cells, as in Case 2. Cytoid bodies are present in this tumor, but are small and few in number.

CASE 9.—*Glioma of optic nerve, mixed finely reticulated and spindle-cell type. Corpora amylacea. Hyaline necrosis. Endothelial phagocytes and giant cells* (case of Dr. Ellet's previously reported).[2]

The celloidin blocks of the tumor were sent to me by Dr. Ellet previous to the publication of his paper, and from these I made and stained differentially many sections. The fixation was in alcohol, which often, as in this case, permits differential neuroglia stains.

History.—A girl, negro, aged 15 years, whose right eye had protruded for five years and was blind, had an optic disk

[1] Salzman: "Studien über das Myxosarkom des Sehnerven," *Arch. f. Ophth.*, xxxix., 94, 1893.

[2] Ellet, E. C.: "A Primary Intradural Tumor of the Optic Nerve," *Tr. Sec. Ophth. A. M. A.*, 1916, p. 143.

which showed postneuritic atrophy on ophthalmoscopic examination. The tumor beginning about 10*mm* behind the globe, was incompletely removed without the globe, through a conjunctival incision. The tumor measured 3.5*cm* by 2.5 *cm*. A diagnosis of "telangiectatic glioma" was made by Dr. H. T. Brooks.

Microscopic Examination.—The tumor in spite of its large size has nowhere broken through the pia. The subdural space, however, is obliterated by compression. The appearances presented by this tumor in different places are highly varied. The different areas pass into each by more or less gradual transition. Near the cut end of the nerve, large areas of the tumor are similar to the intraneural portion of Case 8, consisting of a highly vacuolated delicate neuroglia syncytium with small round nuclei. The differential neuroglia stain shows an abundance of fine neuroglia fibrils running irregularly between the cells. This tissue undergoes transition into neuroglia tissue containing long coarse neuroglia fibrils running parallel to each other and generally abutting perpendicularly on the connective tissue septums. The nuclei in this tissue are still round, but are less abundant and sometimes extremely scanty. Toward the periphery this coarsely fibrillated tissue becomes more and more abundant until it greatly predominates. The fibrils in it are here not often arranged in definite bundles, but occur in irregular masses in which they have the same general directions. The nuclei are usually round, but occasionally spindle cells with oval nuclei are seen between the fibrils. In this tissue, cytoid bodies are extraordinarily abundant, and unusually large.

In places the tumor contains numerous small irregular cystic spaces filled with serum. In the central portion of the tumor there is an area of complete hyaline necrosis, about 7*mm* by 3*mm* in size, which also contains numerous calcified corpora amylacea. In the neighborhood of this area, the veins are greatly dilated and many of them contain fibrinous thrombi. There are also here interstitial hemorrhages. In the looser tissue around this area, and also in places of considerable distance from it, there are numerous endothelial phagocytes. Some of these contain red blood corpuscles, but most of them are distended with fine vacuoles, evidently left by fat droplets which have been dissolved out in the preparation of the specimens. In one place there are a considerable number of giant cells, some of them typically of the Langhan's type. These are undoubtedly not derived from the tumor cells but from the endothelial phagocytes, that is to say, they are foreign body giant cells enclosing products of necrosis. Cells in mitosis are occasionally seen,

but these also are probably not tumor cells but endothelial leucocytes. The tumor nowhere shows any infiltration with other chronic inflammatory cells. A few tumor cells containing blood pigment are to be seen.

The tumor shows one fairly large area containing numerous calcified corpora amylacea, which is decidedly different from any other portion of the tumor, and bears considerable resemblance to the white matter of a normal brain. It consists of a matrix of fine neuroglia fibrils running in various directions, in which the cells are relatively scanty. Most of the cells have small round nuclei surrounded by a small amount of cytoplasm which stains very indistinctly. These cells grade into other cells having a considerable amount of cytoplasm taking both eosin and hematoxylin stains, which contain large nuclei eccentrically placed. A few of the latter cells have long processes which give them considerable resemblance to ganglion cells. None of them show Nissl bodies, even after thionin staining, and some of them contain two nuclei. All transition forms between these cells and typical neuroglia cells can be found, so that they are undoubtedly large neuroglia cells.

The tumor nowhere contains tissue resembling that of a myxoma.

The connective tissue stroma, as revealed by Mallory's connective tissue stain, is not abundant and is confined chiefly to the walls of the blood vessels. Elastic tissue is present only within the stroma. The blood vessels are unusually abundant and large in caliber.

In front of the tumor, the arachnoid has undergone marked proliferation and produced a mass of laminated hyaline tissue. This has not been invaded by the tumor. In his brief histologic description of this case, Brooks described a constriction in the nerve. This appearance is undoubtedly an artefact resulting from the operation, due to a sharp bend in the nerve and crushing of the latter.

CASE 10.—*Glioma of optic nerve. Spindle-cell and coarsely reticulated type. Numerous cells resembling ganglion cells*[1] (case of Dr. Cohen's, previously reported).[2]

History.—A boy, aged 18, had had exophthalmos of long duration, without loss of ocular motility. His vision was nil. There was postneuritic atrophy. Roentgen-ray examination and Wassermann test were negative.

Krönlein operation was used in the removal of the tumor

[1] Tissue from the tumor was sent me by Dr. Louis Meeker.

[2] Cohen, M.: "Primary Intradural Tumor of the Orbital Portion of the Optic Nerve," ARCH. OPHTH., xlviii., 22, (Jan.) 1919.

without the globe, followed in five weeks by atrophic changes and pigmentation of the choroid and retina. The tumor was separated 6*mm* from the globe, and measured 2.8*mm* by 1.5*mm*.

Dr. Ewing, who examined sections of the tumor, made a diagnosis of ganglionic neuroglioma.

Microscopic Examination.—The specimen, which had been fixed in liquor formaldehydi, consists of one half of the tumor cut longitudinally and embedded in celloidin. Sections were stained in hematoxylin and eosin. No normal nerve tissue is included in the specimen. The tumor is confined to the nerve stem and has nowhere invaded the subdural space. It is composed of two types of tissue. The predominating tissue under low magnification appears to consist of a homogenous matrix which stains rather strongly in eosin and contains numerous nuclei. Careful examination under the oil immersion lens, however, shows that the matrix is composed of fibrils running in the interspaces of a cell reticulum. The cytoplasm of the cells stain so much like that of the fibrils that it is difficult to make out. Near the cut ends the tumor tissue is almost exclusively of this type and here fills the interseptal spaces of the nerve. The fibrils running in a longitudinal direction. In the central portion of the tumor, the tissue to a great extent loses its regular arrangement, and the fibrils run in various directions. The other type of tissue occurs in the form of small irregular areas within the first type of tissue, from which it is evidently formed by a process of rather abrupt transition. It consists of a cell syncytium containing large irregular spaces traversed by a few fine processes from the cells. The nuclei are generally small and round, and are surrounded by a considerable amount of cytoplasm. This tissue has some resemblance to myxomatous tissue, but the spaces contain no mucin and are apparently empty. It occurs especially near the connective tissue stroma and blood vessels, and in places seems to intermingle with the stroma. No definite cysts have been formed.

The nuclei of the first type of tissue vary greatly in size and shape. Many are small and round, others are long and oval and a considerable number are very large and round. Within this tissue, there are also many large cells with long processes which give them considerable resemblance to ganglion cells. Careful examination of these cells, however, convinces me that they are really large neuroglia cells, for they show numerous minute processes extending out into the surrounding tissue, and never contain Nissl bodies. Almost all of them show degenerative changes involving both the cytoplasm and nuclei, and the cytoplasm often shows fine vacuolization indicative of fatty degeneration.

Sometimes the nuclei display the ring formation not infrequently assumed by the nuclei of degenerated neuroglia cells of an optic nerve, which cells are probably precursors of corpora amylacea. This tumor, however, contains no definite corpora amylacea.

At the periphery of the tumor, the cells of the first type of tissue tend to become spindle-shaped and the fibrils to run longitudinally. Here a few cytoid bodies are recognizable. In one place, the pia has been invaded, but not perforated, by this type of tissue, and the invading tissue contains cytoid bodies in great number.

The subdural space has been obliterated by compression. The arachnoid has undergone hyperplasia to a considerable extent.

Differential Neuroglia Stain.—Sections stained directly in phosphotungstic acid hematoxylin show few if any neuroglia fibrils. In sections stained for twenty-four hours in Verhoeff's elastic tissue stain,[1] then twenty-four hours in phosphotungstic acid hematoxylin, then differentiated in a dilute solution of potassium permanganate followed by a solution of oxalic acid, neuroglia fibrils are brought out in a remarkable manner. The fibrils are abundant throughout the tissue. Most of them are large in caliber, and similar to the coarse fibrils in Case I, but fine fibrils are also seen. The stain also brings out an unsuspected abundance of cytoid bodies throughout the tumor, but they are most numerous at the periphery. Various stages in the formation of these bodies within coarse deeply staining fibrils can be easily traced. The fibrils in which they are formed cannot be traced into connection with cells, probably because by this method of staining the cells are stained very feebly. Judging by the findings in Case I, however, it is probable that most, if not all, the neuroglia fibrils in this tumor are really cell processes. In the place where the tumor has invaded the pia, neuroglia fibrils and cytoid bodies have been formed in extraordinary abundance.

CASE II.—*Glioma of optic nerve, spindle-cell type*[2] (case of Dr. Reese's, previously reported).[3]

History.—A boy, aged 5, exophthalmos had been noted

[1] Verhoeff, F. H.: "An Improved Differential Elastic Tissue Stain," *J. A. M. A.*, lvi., 1326, (May 6) 1911.

[2] A section of this case was sent me by Dr. James Ewing.

[3] Reese, R. G.: "Successful Removal of Orbital Portion of the Optic Nerve for a Primary Intradural Tumor, with Preservation of the Eye-Ball and Mobility, by the Krönlein Method," ARCH. OPHTH., xlix., 515, (Sept.) 1920.

for two years, following an injury to the right side of the head. The pupil reacted sluggishly to light. Vision could not be tested. The disk showed neuritic atrophy. Krönlein operation was performed for removal of tumor without globe, followed by neuropathic keratitis. Seven months after operation, the retinal vessels seemed pervious, and in the macular region there was marked chorioretinal atrophy with pigmentation.

The tumor measured 25*mm* by 13*mm* in diameter, and was entirely subdural. The original microscopic examination was made by Dr. James Ewing, whose diagnosis was myxoglioma.

Microscopic Examination.—The tumor is almost entirely intraneural and nowhere distends the subdural space. One end of the specimen contains a portion of uninvolved nerve, the other end does not, so that the removal of the tumor was incomplete. In structure, the tumor is of the spindle-cell type, identical with that of Case 2. As in the latter case, there is gradual transition of the neuroglia of the uninvolved nerve stem into that of the tumor. Small cystic spaces are present but are few in number. Cytoid bodies can be seen, but with difficulty, owing to the thickness of the section and the feeble eosin staining. The subdural space has for the most part been obliterated by compression, but in places is filled with proliferated arachnoid tissue. The pia has been invaded by the growth which in places has also begun to extend into the dura.

(*To be concluded in May number.*)

NON-SURGICAL TREATMENT OF MALIGNANT EPIBULBAR NEOPLASMS.[1]

By Dr. EDWARD B. HECKEL, Pittsburgh, Pa.

(With seven illustrations on Text-Plates XI. and XII.)

WHILE malignant epibulbar neoplasms are not common, yet they are so important that they should command our closest study. Prior to the advent of the Roentgen-ray and radium, surgery offered the only means of treatment. The usual procedure was: an excision of the neoplasm and in most, if not all, of the cases a rapid return of the growth, followed later by an enucleation and not infrequently by a total exenteration of the orbit and as a rule all without control of the malignancy. It may be good surgery to excise all malignant growths provided they can be excised completely and the cutting procedure limited to the surrounding tissue. It goes without saying that epibulbar neoplasms do not provide these conditions. The space is limited and all the tissue valuable, none should be sacrificed. The principal commandment of the cancer decalogue is "do not cut across a cancer and leave a part behind. The part remaining will grow more rapidly than if it had been let alone altogether." Malignant tissue is of an embryonic type and therefore especially vulnerable to Roentgen-ray and radium so that we may reasonably say that Roentgen-ray and radium produce a selective necrosis of malignant tissue.

Prior to 1910 our results in the treatment of these cases with the Roentgen-ray were not very flattering, especially as to the

[1] Read before the Twenty-Sixth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology, Wednesday, October 19, 1921, Philadelphia, Pa.

preservation of a functioning eye. Most of these cases resulted in a sloughing of the cornea as a result of drying due to long exposure under the Roentgen-ray.

At the meeting of our Academy in Chicago in 1915 it was the writer's privilege to report a case of epibulbar sarcoma, treated with Roentgen-ray in 1910, with a technique which resulted in a complete cure of the malignancy and the preservation of a perfectly functioning eyeball. The success in this case was, the writer believes, the result of keeping the anterior segment of the eyeball wet during the exposure to the Roentgen-ray, by the continuous dropping of a normal salt solution over the eyeball. Since then we have been able to discard the salt solution, due to better and more efficient X-ray tubes. The technique employed in the following cases consisted of placing the patient in a recumbent, comfortable position, the face was covered with a piece of tin foil, perforated with a small hole a little larger than the neoplasm and so placed that when the patient was directed to look in a certain direction the aperture in the tin foil was directly over the neoplasm. This procedure permits the patient the free use of the eyelids so that he may wink as often as he desires; in this manner the cornea is kept moist and cannot dry.

CASE 1.—A. L. R., aged 71 years. Referred by Dr. McMurray of Washington, Pa. Patient first noticed "a small lump," on his right eye about one year ago; it had been growing gradually till it represented the appearance shown in Fig. 1. The eyes were negative in every other respect. R.V. = $\frac{20}{20}$; with + 2.25 D.S., L.V. = $\frac{20}{20}$; with + 1.00 D.S. ⊂ + 0.50 D.C. ax. 60°. A small piece of the neoplasm was excised and examined by Dr. Haythorn of the Singer Memorial Research Laboratory of the Allegheny General Hospital with the following result:

"Section from the corneoscleral junction. Serial sections were made through the whole piece of the tissue removed. A bit of sclera shows an intense infiltration with plasma cells. The portion nearest the cornea contains several papillary outgrowths with well developed epithelial pearls. The cells near the lower portion of the epithelial layer are atypical, picnotic, and show well developed intercellular ridges. At the end nearest the cornea the cells show atypical arrangement with the formation of concentric epithelial bodies in their lowermost layer. As no stroma is present

ILLUSTRATING DR. EDWARD B. HECKEL'S ARTICLE ON "NON-SURGICAL TREATMENT OF MALIGNANT EPIBULBAR NEOPLASMS."

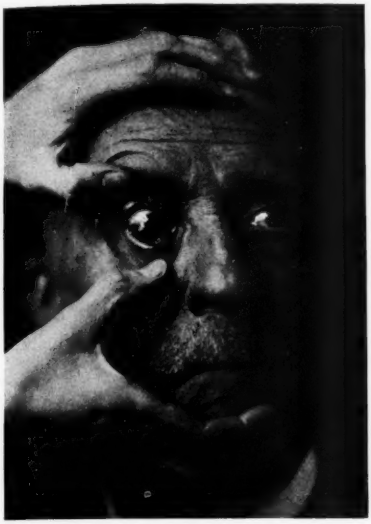

FIG. 1.—A. L. R., æt 71 years.
Epidermoid Carcinoma.

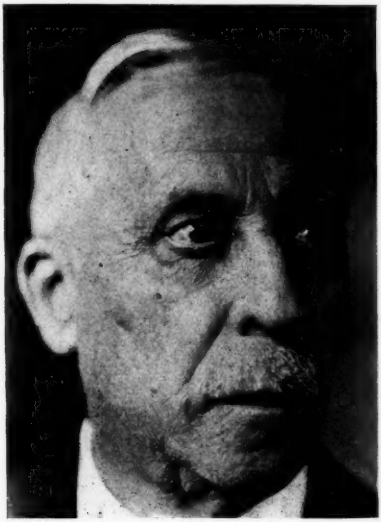

FIG. 6.—A. L. R., same as Fig. 1.
After Treatment.

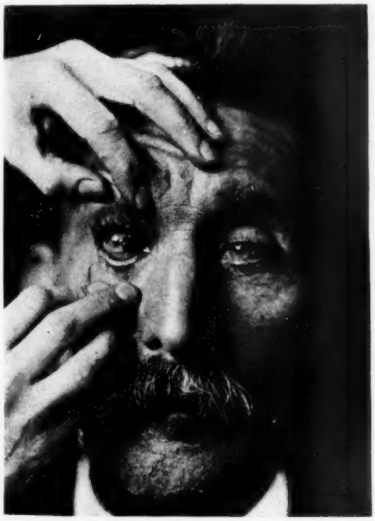

FIG. 4.—G. W. S., æt. 61 years.
Squamous Cell Carcinoma.

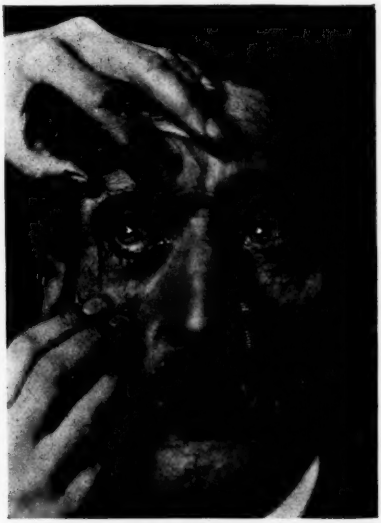

FIG. 7.—G. W. S., same as Fig. 4.
After Treatment.

beneath the layer it is impossible to say whether actual invasion has taken place or not."

Diagnosis: Epidermoid carcinoma. See Fig. 2 and Fig. 3.

The Roentgen-ray was applied by Dr. G. W. Grier as follows: First application over the lesion as above described was made with 5 M.A. current at a voltage corresponding to 6½ inch parallel spark gap; the distance from anode of tube to lesion was 8 inches; no filter of any kind was used. This current was applied for 2½ minutes. *Second exposure*, five days later, the same treatment was applied. *Third exposure*, three days later, the same treatment was applied except that the exposure was three minutes long instead of 2½ minutes. *Fourth exposure*, four days later, the same treatment as that of third. After this series of treatments the patient was given a rest of twenty-one days. At the end of this time there was still a small part of the growth remaining. Treatment was then again resumed (*fifth exposure*) twenty-four days after the fourth exposure; the same technique was used except that this time the tube was 10 inches from the lesion and the length of treatment was extended to 3½ minutes. *Sixth exposure*, three days later; he was given a similar treatment at 10 inches distance; the length of treatment was three minutes. *Seventh exposure*, two days later; he was given the same treatment as the fifth exposure. One month later the lesion had completely disappeared and remains so. See Fig. 6.

Case 2.—G. W. S., aged 61 years. Patient first noticed "a small lump" on the right eyeball about six months ago; growth quite rapid within the last four or five weeks, when it presented the appearance shown in Fig. 4. Otherwise the eyes were negative. R.V. = $\frac{20}{40}$; L.V. = $\frac{20}{20}$. A piece of the neoplasm was excised and examined by Dr. Alter of the Western Pennsylvania Hospital with the following result:

"Specimen consists of small nodule 3*mm* in diameter. It is quite firm. Section of the small nodule shows irregular proliferation over the surface epithelium and covered with hemorrhage. The section is diagonal and the nature of the invasion is not very clear.

"Diagnosis: Squamous cell carcinoma." See Fig. 5.

Dr. G. W. Grier applied the Roentgen-ray as outlined above: First application over the lesion as above described was made with 5 M.A. current at a voltage corresponding to parallel spark gap of 6½ inches; the distance from the lesion to the anode on the tube was 9½ inches, no filter of any kind was used. The exposure lasted 3½ minutes. *Second exposure*, two days later, under the same conditions. *Third exposure*, four days later, same technique. *Fourth exposure*, two days later, same technique. Patient

was then given a rest for nineteen days and as some of the neoplasm remained he was given the *fifth exposure*, with same technique, except that the time was extended to four minutes. *Sixth exposure*, three days later, same technique. *Seventh exposure*, four days later, same technique. *Eighth exposure*, two days later, same technique. After this the patient was given a rest for twenty-three days, when the lesion had almost disappeared, but as some remained he was given the *ninth exposure*, with the same technique. *Tenth exposure*, two days later, the *eleventh exposure*, two days later and three days later the *twelfth exposure*. All trace of the neoplasm has now disappeared. See Fig. 7.

Summary of treatment of the first case, total exposures, seven, time consumed, thirty-five days.

Summary of treatment of the second case, total exposures, twelve, time consumed, seventy days.

While the results in the reported cases by the writer are all that could be desired and therefore surgical interference not justified in similar cases, he is not unmindful of neglected cases where the neoplasm projects through the lid aperture as a cauliflower growth; in such cases it would be well to excise the protruding mass with the actual cautery or electro-cautery heated to a cherry red heat, and then follow this immediately with Roentgen-ray or radium.

ILLUSTRATING DR. EDWARD B. HECKEL'S ARTICLE ON "NON-SURGICAL TREATMENT OF MALIGNANT EPIBULBAR NEOPLASMS."

FIG. 2.—Early Epidermoid Carcinoma, Junction of Cornea and Sclera. Zeiss Obj. A A.

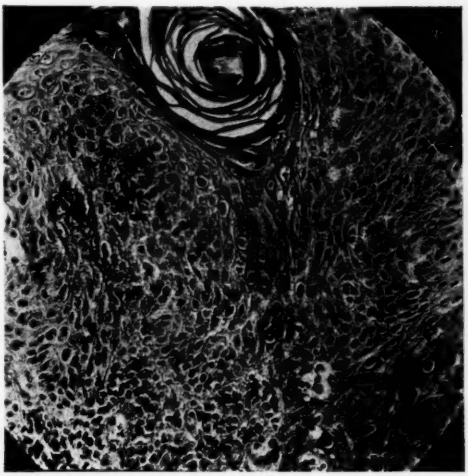

FIG. 3.—Epithelial Pearl and Infiltration of Epithelial Mass. Zeiss Obj. dd.

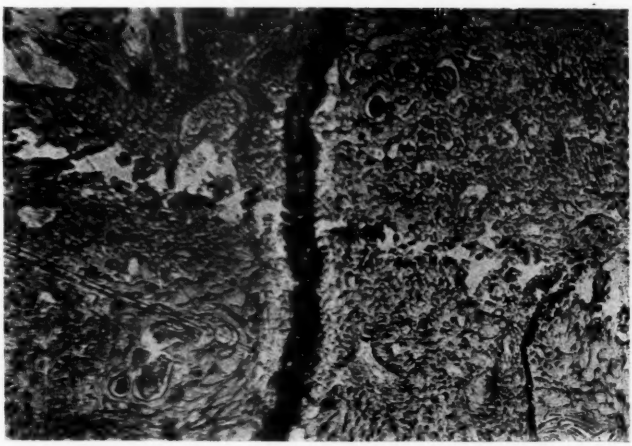

FIG. 5.—Squamous Cell Carcinoma of Conjunctiva; Numerous Cancroid Pearls of the Ingrowth.

CYSTS AND CYSTIC TUMORS OF THE CARUNCLE: WITH SPECIAL REFERENCE TO SEBACEOUS CYSTS.

By Dr. JOHN GREEN, Jr., St. Louis, Mo.

THE ocular caruncle is a small, reddish, nipple-like prominence situated to the inner side of the semilunar fold, and occupying the bottom of a horseshoe-shaped excavation at the inner angle of the eye. Histologically, it is, in the words of Fuchs, "A small island of skin containing sebaceous glands, sweat glands, and small glands like Krause's glands and having its surface covered with small light colored hairs."

Although its structure identifies it as an appendage of the skin, most textbook writers discuss its diseases and abnormalities in the chapter devoted to the conjunctiva, probably for the reason that situated as it is in close proximity to the conjunctiva, it is often affected secondarily to inflammations of this membrane.

A swollen and congested caruncle may be one of the signs of eye strain, especially "in cases of imperfect amplitude of convergence" (Weeks). For this condition de Schweinitz has suggested the name of "symptomatic or functional encanthus."

New growths of the caruncle are exceedingly rare. For example, among 60,000 eye patients, Waetzold (1) saw only six examples of neoplasm of the caruncle, of which three were congenital.

Beauvieux's (2) classification of tumors of the caruncle is as follows:

Tumors of Epithelial Origin.

A. Benign
   Adenoma
   Papilloma

Papillomatous polyps
Granuloma
Cysts

B. Malignant
Epithelioma
Carcinoma

Tumors of Conjunctival Origin.

A. Benign
Fibroma
Hyaline Tumor
Angioma
Lymphangioma
Lymphoma

B. Malignant
Sarcoma
Lymphosarcoma
Melanosarcoma

Mixed Types.

Simple Hypertrophy
Papillary Hypertrophy
Telangiectatic Fibroma
Lipodermoid
Dermoid Cysts.

Although cysts originating from the conjunctiva are not very rare, there have been only a few reports of cases in which the cyst originated from the caruncle or semilunar fold. The present communication is concerned solely with cysts and cystic tumors of the caruncle.

One of the earliest reports of dermoid cyst of the caruncle was made by Berl (3). The caruncle, large at birth, began to grow slowly when the patient was twenty years of age. Twenty years later it measured $10 \times 9 \times 8mm$ and was then excised. The external surface, desiccated in consequence of exposure in the palpebral aperture, was covered with pavement epithelium. Underneath was dense connective tissue containing hair follicles and sebaceous glands and deeper still loose connective tissue traversed by blood vessels. Within was a well defined cyst which contained hair follicles and hair fragments.

Cysts originating from the modified sweat glands of the

caruncle have been described by Piccoli (4) and Rumschewitsch (5).

Piccoli's patient was a marble worker who had a chronic trachoma, with its usual accompaniments (blepharophimosis, entropion, etc.). Following a slight trauma in the region of the internal angle, a smooth yellow nodule developed in the center of the hypertrophied semilunar fold. The growth proved to be a cyst containing disintegrated red blood cells and pigment. Its wall was covered with several layers of flattened epithelial cells.

Rumschewitsch's first case concerned a man with chronic trachoma. For two years a tumor had been growing from the caruncle. At the time of operation, the pear-shaped tumor was 1*cm* in diameter, pedciled, translucent, of a pale pink tint. Examination showed the surface composed of layers of cylindrical and flattened epithelium, the outer layers being distinctly cornified. Beneath the epithelium lay dense connective tissue traversed by numerous dilated blood vessels and infiltrated with lymphoid cells. Sebaceous glands and hair follicles were situated in the lower anterior part of the tumor. The upper part contained cavities, the epithelial lining of which showed signs of mucoid degeneration. In the lower posterior portion formations apparently representing longitudinal and transverse sections of gland follicles could be observed. These formations consisted of many layers of epithelium surrounded by lymphoid infiltration. These glandular ducts (modified sweat glands) had participated in the formation of cysts, which had formed as a result of obstruction of the ducts and dilatation of the lumina.

Rumschewitsch's second case concerned a 26-year-old patient from whom he had removed the transition folds on account of hyaline degeneration of the conjunctiva. Two years later he discovered a translucent tumor, of pale rose color with vertical diameter of 1.5*cm* occupying the upper portion of the fold. The posterior portion of the tumor was connected with the underlying tissue. Examination of the growth showed that it contained a large cavity, which was divided by a septum into an upper, larger, and a lower, smaller, part. The cyst wall revealed conditions analogous to those observed in the first case. Changes (inflammatory and

degenerative) in the epithelium of the glandular ducts likely to give rise to an obstruction of the ducts and cystic degeneration were observed.

Adenomata of the caruncle are rare. They may or may not present minute cysts in the body of the tumor. A typical example of cystic adenoma is described by Prudden (6). In a woman of seventy-four a reddish, soft, globular tumor, $4 \times 5mm$, had been growing from the inner canthus of the left eye for seven years. It was encapsulated and spongy. The spongy portion consisted of tubular branching structures with central lumina, lined with cuboidal and cylindrical epithelium. The amount of stroma was small, some of the tubules were cystic, some empty, some contained granular material and disintegrating cells. In the surrounding tissues, sections of sweat glands were found. The surface lining had the character of the caruncular epithelium.

Testelin (7) observed a tumor of the caruncle in a girl of 18 years. It was located at the superior and external portion of the caruncle and invaded the semilunar fold and bulbar conjunctiva almost to the cornea. It was the size of a large pea, slightly flattened and lobulated, firm, yellowish gray, not adherent to the sclera. Microscopically it was formed of glandular cul-de-sacs of the same structure as the normal glands, but larger and in greater numbers. It was probably a sebaceous adenoma.

As is well known sebaceous cysts may occur in the skin of the lids as in other parts of the body. Tiny retention cysts of sebaceous glands—milia—are frequently found in the skin of the lids.

Parsons (8) states that the sebaceous glands of the caruncle "may be affected with diseases common to them elsewhere, *e.g.* acne: and concretions may form in them from retained secretions becoming impregnated with calcium salts." In view of this statement, it is indeed surprising that one of the common affections of sebaceous glands, *e.g.* sebaceous cysts, should not be frequently met with in the caruncle and yet a careful personal search of the literature supplemented by an investigation by the Research Department of the American College of Surgeons has yielded only a single report of an example of this type of cyst. I cannot believe that these cases

are so excessively rare as the paucity of published cases would lead us to assume. As they give rise to little or no discomfort, patients who harbor them are not prone to consult an oculist (in my case, the patient came merely because of asthenopic symptoms). Probably, also, many examples have not been reported, as surgeons may have assumed, as I did before I began to look up the literature, that they are not uncommon.

CASE REPORT.

Miss B. P. W., age 38 years, colored, consulted me July 28, 1921, complaining of rather vague asthenopia. During the routine examination, I discovered that the left caruncle projected 1.5*mm* in front of the palpebral aperture. On examination with the binocular loupe I observed a yellowish mass apparently situated just underneath the skin of the caruncle. The growth was slightly elastic to palpation, was smooth and ovoid, with the long diameter (about 3*mm*) horizontal. The caruncular skin seemed to be firmly adherent to the mass. The appearance and "feel" of the little tumor was precisely that which we so often find in sebaceous tumors of the lids and vicinity and I had no hesitancy in making a diagnosis of sebaceous cyst.

Under novocain infiltration, I made a horizontal incision through the superficial layers of the caruncle and at once came upon the yellow, tense, glistening cyst wall. The caruncular skin was adherent throughout, so that careful blunt dissection was required. Just as I was making the last few snips with the scissors in freeing the cyst from the underlying tissue, it ruptured anteriorly and a small quantity of yellow, homogeneous, smooth, soft, cheesy material oozed out. On the appearance of this material, so perfectly typical of the contents of cutaneous sebaceous cysts, all doubts as to the diagnosis were dissipated from my mind. The specimen was submitted to Dr. Downey L. Harris, the pathologist, who reported as follows:

"The specimen from B. W. is a yellowish white oval mass 2 × 3*mm* with a smooth fibrous exterior. Sections through the tissue show it to be a smooth thin-walled cyst with soft cheesy contents. No hairs were found in the cyst. Microscopical examination shows the cyst to be lined with one or more layers of flat or cuboidal cells. These cells have a deeply-staining oval nucleus with a relatively small amount of protoplasm.

"*Diagnosis.*—Retention cyst (sebaceous cyst)."

The only case in the literature similar to the above is that reported by Steiner (9).

Female, European, 72 years, complained of epiphora and blindness of the right eye. This eye is blind from cataract. On the lower temporal aspect of the caruncle is a yellow white, egg-shaped tumor 3 × 2*mm*. This lies just underneath the surface of the caruncle, is sharply circumscribed, movable, and has a smooth surface. The pressure of the tumor has displaced the lower punctum, accounting for the epiphora. The tear duct is not occluded. The little tumor, with a narrow strip of conjunctiva and half of the caruncle, was removed.

The tumor consisted of a cyst lying immediately under the surface and separated from it by a narrow layer of connective tissue. The cyst wall was sharply defined, thin, and fragile. Through the action of ether and alcohol used in fixation, the contents had almost entirely disappeared, but in some places detritus (fat?) was still visible. The cyst wall presented several layers of epithelial cells and a distinct membrana propria. The epithelial cells were small, cuboid, stained well, and corresponded to the epithelial cells of sebaceous glands. Where the epithelium was thicker, drops of secretion could be detected in the protoplasm of the centrally located cells. Two or three layers of epithelial cells lined the periphery.

Normal sebaceous glands could be seen in the immediate neighborhood of the cyst. Some of the glandular cul-de-sacs contiguous to the cyst were flattened. At one place there was a direct connection between the epithelium of the cyst and that of a neighboring sebaceous gland, at which site the membrana propria was missing. Here and there were found little collections of round cells.

Diagnosis.—Retention cyst of a sebaceous gland (resembling a milium).

The differential diagnosis should offer no difficulties. The possibility of a dermoid or a cyst developing from the modified sweat glands should be borne in mind.

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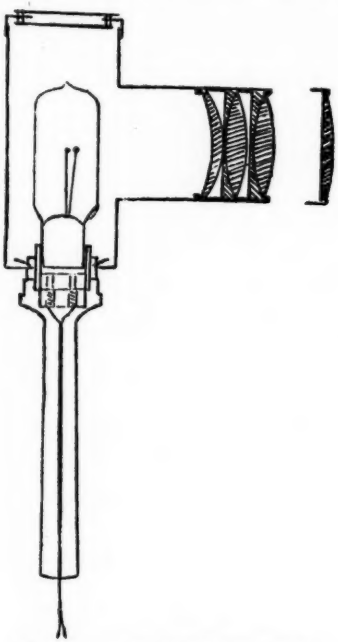
AN OPERATING HAND LAMP FOR OPHTHALMIC WORK.

By Dr. A. MAITLAND RAMSAY, Glasgow.

(With one illustration in the text.)

FOR several months I have been using a hand lamp in which the source of illumination is the "pointolite" electric lamp of the Ediswan Co., and as I have been so satisfied



Hand Lamp for Ophthalmic Work.

with it in all operations on the eye, I venture to bring it to the notice of ophthalmic surgeons. The lamp is of 30 candle

power and is enclosed in a metal case with an aperture on one side in which a system of achromatic lenses is so fixed that the emergent rays are parallel. By this means the field of operation is evenly illuminated by a disk of light free from all shadows. A resistance is supplied with each lamp, whereby it can be used with a direct current from the main of any voltage between 100 and 250, and a special lamp can be got to work on any direct current down to 32 volts. Up to the present, however, a lamp has not been constructed for an alternating current. A convex auxiliary lens of 3 diopters can be adjusted in front of the fixed lens in order to bring the light to a focus. An opaque capsule after cataract extraction, no matter how thin it may be, is thereby brought so clearly into view that capsulotomy operations can be performed with great precision. The lamp can be used for a considerable length of time without any inconvenience from heating. It is made by John Trotter, Ltd., 40 Gordon Street, Glasgow.

TRIFOCALS MINUS WAFERS.[1]

By TALBOT R. CHAMBERS, F.A.C.S., Jersey City, N. J.

(With one illustration in the text.)

SINCE presbyopes must wear glasses, they should be as inconspicuous and efficient as possible. The lens without pasters is inconspicuous and the trifocal is far ahead of the bifocal for efficiency.

There are presbyopes who claim inability to use bifocals. Such would not be interested in trifocals.

The trifocal offers a larger field for near work and avoids the necessity for changing glasses for distances between 14″ and 50″.

It has its limits. The external field of far vision is lessened by reason of the interference of the intermediary. This is its chief insufficiency but after some days of constant use the wearer acquires confidence and facility.

They are recommended for the surgeon, oculist, musician, librarian, bookkeeper, engineer, mechanician, especially the card player and automobile driver.

It goes without saying, that the refraction error must be accurately corrected and the adjustment right. Caution must be taken that the lens cannot revolve in its frame. This is managed by making the frame elliptical instead of circular.

An individual needs +1 for far; +3 for intermediary and +4 for reading.

The most satisfactory result is obtained from a kryptok slab of crown and flint glass, the crown being +3. and the flint +4.

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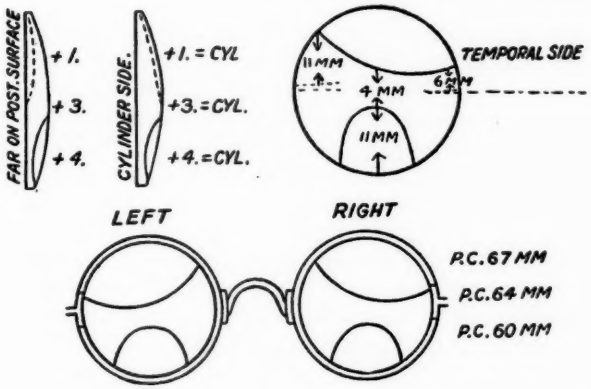
[1] Read before the Eye Section, New York Academy of Medicine, Nov. 21, 1921.

If astigmatism needs correction, the cylinder is ground on the posterior surface of the slab. For the individual needing +1 for distance, the +1 is ground on the anterior surface if the posterior is taken for the cylinder. If there be no cylinder



the +1 is ground on the posterior surface. In either case it is ground so that about 4*mm* is left for intermediary (+3). In order to get a larger field on the temporal side it must be ground as in cut, so that there is not more than 6*mm* of intermediary above center on temporal edge of lens.

In sample shown, the pupillary center for the far was 67*mm;* for the intermediary 64*mm;* and for the near 60*mm*. Of course these centers must be according to the individual needs.

Toric lenses, all will agree, are more suitable for presbyopes and trifocals are no exception.

Discussion.—Dr. J. H. Clairborne stated trifocals are not new but the arrangement here suggested contains new ideas which if practical have value.

In reply to questions. The cost would probably be half more than that of the ordinary bifocal kryptok. The lens could only be made by a high grade mechanic and it is necessary to employ a cemented wafer for protection during the grinding and this thrown away on completion of the job.

There is no chromatic nor prismatic aberration as was proven by sample displayed.

REMARKS ON DR. C. KOLLER'S PAPER, "THE PHYSIOLOGICAL MODE OF ACTION OF MYDRIATICS AND MIOTICS—EXPLAINING THEIR EFFECT IN HYPERTENSION (GLAUCOMA)."

By Dr. MARK J. SCHOENBERG, New York.

ON rare occasions a paper appears in the ophthalmological literature which by virtue of its contents or its author or both commands our special attention. Undoubtedly there is no subject in which we are more keenly interested than glaucoma and no name more illustrious and better entitled to a respectful hearing than that of Dr. Carl Koller. The suggestions and conclusions contained in his paper are of great interest but contradict a number of facts established by physiological, pharmacological, and clinical observations. May we be allowed to discuss some of the salient points brought out by this paper.

The predominating ideas in Dr. Koller's paper are:

1. That "for the habitual width of the pupil the state of fullness of the iris vessels is the determining factor."

2. That "mydriatics slow up circulation by producing anæmia through the constriction of small arteries, whereas myotics by dilating the small arteries speed up circulation and thus favor the absorption of abnormal quantities of transuded serum."

3. That "in acute glaucomatous attacks the circulation is slowed up and stagnant and that mydriatics slow up circulation whereas myotics speed it up, these adverse, respectively favorable effects becoming intelligible."

Let us analyze the facts on which Dr. Koller's conclusions are based.

A. Dr. Koller explains the small size of the pupil in con-

gestion of the iris and the widely dilated pupil after death by the apparently simple fact that the iris blood vessels are full in the first and empty in the second condition. Is this explanation really sufficient? Death is followed by general relaxation of all the sphincters in the body, caused by the cessation of the normal innervation of these sphincters which keeps up their continuous tonus. The relaxation of the sphincters of the urinary bladder and of the anus after death, are they due to the emptiness of blood vessels in these respective regions? The same line of arguing is applicable to the dilatation of the pupil after an animal is bled to death; the vascular emptiness in the iris may have something to do with the phenomenon, but the main factor is identical to that causing relaxation of the sphincters in other parts of the body (the cessation of the tonic innervation of the sphincters of the pupil after death).

The contraction of the pupil in a congested iris no doubt is due to the state of fullness of the blood vessels, but who can deny that the nerve fibers of the sphincter are also stimulated by this congestive state?

B. "An injection of methylen blue in the aorta under pressure is followed by immediate very marked myosis." This experiment is brought forth as a proof that the pupil can be narrowed by simply filling the iris blood vessels. While this experiment seems conclusive its author does not state whether the amount of pressure used in injecting the aorta was excessive and thereby results were obtained under circumstances entirely outside of physiological conditions.

C. The fact "that all states of cerebral congestion go with narrow pupils (sleep, morphinism and meningitic coma) whereas all states of cerebral anæmia (syncope, epileptic seizure) go with wide pupils" does not, to my mind, prove that the size of the pupils is necessarily due to the state of fullness of the iris blood vessels in these conditions.

In the first place it is questionable whether the brain is congested during sleep and anæmic during an epileptic attack. Then, the congestion and anæmia of the iris have not been demonstrated yet by an actual study with the corneal microscope in patients with cerebral hyperæmia and anæmia. Furthermore if there is any tissue the blood vessels of which

should reflect the state of fullness of the cerebral blood vessels, it is certainly the retina and not the uvea. Do the retinal blood vessels invariably act like the mirror of a vascular state of congestion or anæmia in the brain or meninges? And if not how can we expect the uveal circulation to do this? In intracranial congestive states where there is so much occasion for the stimulation of the pupillo-motor nuclei or of the nerve fibers in their course to the eyeball, we can easily explain the contraction of the pupil. In anæmic conditions of the intracranial contents the partial or total cessation of tonus innervation of all the sphincters in the body including the sphincter pupillæ (involuntary defecation, urination) is sufficient to explain the pupillary dilatation.

Nobody denies that pupils can be widened by emptying the iris blood vessels and narrowed by filling them, but so far the facts brought forth do not prove that the state of fullness of the iris vessels is the main determining factor of the size of the pupil. They do not exclude the very plausible probability that the main determining factor of the pupillary size in normal individuals is the state of balance between the innervation of the two antagonistic muscles in the iris (sphincter and dilator).

D. *Atropine.*—Has atropine a local vaso constrictive action? The paper under discussion says yes and brings forth as proofs:

a. The disappearance of the ciliary congestion in iritis when treated with atropine.

b. The shrunken mucosa of the nose and the blanching of the pharynx following an overdose of atropine by instillation.

(a) But atropine blanches the eye in iritis because it puts the iris and ciliary body at rest. Congestion is increased in inflamed organs when they are kept active and it is markedly reduced when they are put to rest. That is why rest is the first rule in the treatment of an inflamed organ. If atropine has a local vaso-constrictive effect why does it not blanch normal eyes without errors of refraction? Why does it produce redness when applied on the skin? Why do blood vessels of an isolated intestinal loop, transfused with a fluid containing atropine, dilate?

(b) An overdose of atropine instillations in the eye gives a shrunken nasal mucosa and blanched pharynx not by produc-

ing vaso-constriction but only after it has been absorbed into the general circulation, by action upon the medulla and upon the secretory glands (cessation of glandular secretion in nose and throat).

E. *Cocaine.* According to Dr. Koller, cocaine dilates the pupil and causes the widening of the palpebral fissure solely or mainly by shrinking the blood vessels in the iris and in the lids. "Inject cocaine in a certain point under the conjunctiva, near the cornea, and the iris will shrink in that very meridian in which the injection was made, the pupil becoming eccentrically pear shaped." It is difficult to understand why this fact should be considered proof that the cocaine acted by shrinking the blood vessels only in this meridian and not by stimulating the sympathetic filament innervating that particular group of dilator fibers. Cocaine is both a vaso-constrictor and stimulator of the dilator pupillæ. If its main pupillo-dilator mode of action is by shrinking the iris blood vessels why does cocaine fail to dilate the pupil in patients with a Horner syndrom?

F. The fact that Adrenaline dilates a sector of the pupil, like cocaine, when injected under the conjunctiva, is not stronger evidence that its action is solely or mainly vascular. Adrenaline is a stimulator of the sympathetic system par excellence; it contracts only such blood vessels which have sympathetic (vaso motor) fibers in their walls; it has no effect upon the blood vessels in the lungs, liver, brain, and heart which do not contain sympathetic fibers. Why attribute pupillary dilatation only to its vaso-constrictor properties and not to its action on the dilator pupillæ? Furthermore, repeated instillations of adrenaline produce a dilatation of the pupil in a very large majority of glaucomatous eyes (Knapp's observation), but not in normal eyes. Is this curious response in glaucoma due to a hyper-sensibility of the iris blood vessels or to the hyper-sensibility of the vaso-dilator sympathetic fibers? An unequivocal answer to this question may be decisive as to the correctness of Dr. Koller's conception. If we would know of a drug which has the property of acting only upon the blood vessel wall but not upon the sympathetic we could make use of it in testing out the agents determining the dilatability of the pupil. Adrenaline is not such a drug because its action is solely on the sympathetic and with the best good-

will there is no way of telling whether the dilatation of the pupil, after a subconjunctival injection of adrenaline, is due to the stimulation of the dilator or to the constriction of the iris blood vessels or both. But pituitrin has the remarkable quality of contracting the smooth muscle fibers in the blood vessels walls. This substance does not act upon the smooth muscles via sympathetic; it produces vaso-constriction even in tissues void of sympathetic innervation. Injected intra-dermally it produces a white patch of ischemia, just as intensely white as the adrenaline, but it causes whiteness by acting directly upon the muscles of the blood vessels, while the adrenaline acts by stimulating the sympathetic nerve endings in the muscle fibers. Now, what is pituitrin's effect upon the pupil? We would expect that if the size of the pupil is determined by the state of fullness of the iris blood vessels, pituitrin, which is a vaso-constrictor par excellence should produce at least as much a pupillary dilatation as adrenaline. The following experiment speaks for itself. Inject one drop of adrenaline under the conjunctiva of one eye and one drop of pituitrin under the conjunctiva of the other eye of the same patient. The pupil in the adrenaline eye dilates about 2/3 times more than that in the pituïtrin eye. Does this mean that the state of fullness of the iris blood vessels is the main factor determining the pupillary width?

G. *Action of Myotics.* If myotics are vaso-dilators when instilled in the eye, why do they blanch sometimes congested glaucomatous eyes? Pharmacology teaches that eserin produces *vaso-constriction* when present in a perfusing fluid passing through the blood vessels of an isolated intestinal loop or even through the lungs. Furthermore the following classical experiment is very suggestive. Placing a frog's eye in a 1% solution of pilocarpine in the dark, the pupil readily contracts. Since it is improbable that the pilocarpine produces vaso-constriction in an exsanguinated, enucleated eye, its action is to be placed on the nerve terminals in the sphincter pupillæ.

The transitory pupillo-constrictor effect of dionin could just as well be attributed to a sensory reflex (pupillary contraction caused by irritation of the cornea). A foreign body or an abrasion of the cornea will contract the pupil very readily. If dionin contracts the pupil not by the pain it

causes, but by vaso-dilatation, why does it not act on the pupil, if applied after a thorough holocainization of the cornea?

The entire question herein discussed would be of microscopic importance if it would not directly concern the problem of glaucoma. It is the acceptance of the application of some of Dr. Koller's ideas to glaucoma that seems most difficult.

"The circulation in an eye with a mild attack of acute glaucoma is sluggish. The pupil is widened and irregular; *this bespeaks constriction of arteries* (italics mine). The arteries of the iris and probably all ciliary arteries are constricted, carrying but little blood, whereas the veins are widened and gorged which means that the whole circulation is stagnant." It is difficult to see how an engorgement of the veins can exist if the arteries are constricted. Taking for granted this unusual possibility how does it happen that the venous engorgement does not disappear spontaneously? Nobody so far has ever pretended that the circulation in the veins is completely stopped. As the veins empty and the narrow arteries drive very little blood towards the veins, there ought to result in glaucoma, according to Dr. Koller's idea, a complete ischæmia. The wide and irregular pupil in glaucoma, is the result of several factors (paralysis of the parasympathetic fibers or stimulation of the sympathetic fibers or both) but surely not to the iris ischæmia alone. "If circulation is impaired, stagnant in glaucoma (nobody can deny this) and if mydriatics slow up circulation, whereas myotics speed it up, these adverse respectively favorable effects become intelligible." This explanation, if well founded, would certainly be a most welcome addition to our store of Ophthalmological knowledge, but in view of the preceding remarks, it can not be accepted without hesitancy. It is not the intention of these remarks to discuss the nature or ætiology of glaucoma. We shall hear about this subject comparatively soon. The following sentences agree better with the teachings of physiology, pharmacology, and clinical experience.

1. The habitual width of the pupil is determined mainly by the state of balance between the intensity of innervation of the two antagonists (sphincter and dilator).

2. Clinical observation does not prove that mydriatics produce an appreciable vaso-constriction in the uvea, and

thereby a slowing up of the circulation, neither that myotics produce a vaso-dilatation and thereby a speeding up of the circulation.

3. The adverse, respectively favorable effects of mydriatics and myotics on glaucomatous eyes is due to their various actions on the sympathetic and parasympathetic nerve endings in the ocular tissues.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON, London.

An ordinary meeting of the Section was held on November 11th, Sir William Lister occupying the chair.

Cases: Mr. Humphrey Neame showed three interesting cases. The first was one of **cyst of Krause's gland.** He did not feel quite sure of the diagnosis, as those glands were not so common in the lower fornix as in the upper.

His second case was that of a lad aged 16 who had **papular formations of the upper lid.** He had noticed nothing amiss until the beginning of October, when there was marked swelling of both upper and lower lids, and some swelling and tenderness of pre-auricular glands. The conjunctival secretion showed no eosinophiles, and the section showed only a zone of round-celled infiltration, not sufficient to account for the papular formation. The character of the case would be settled on the histological evidence.

The third patient he showed had **tuberculosis of the conjunctiva.** The boy went for a holiday last year 40 miles away, going down by cycle, and at the end of the journey he was very exhausted. After returning to work, while stooping down, he felt something "go" in the left eye, and from that day the sight of the eye had gradually failed, so that in 6 weeks he could do no more than perceive a hand close in front of him. In September, 1920, he noticed swellings in the neck, and in March this year a cough started, and watering of the eye previously sound (the right). Sent to a tuberculosis hospital the diagnosis made was Hodgkin's disease; there were no signs of tubercle in the chest, and no tubercle bacilli were

found in the sputum. He had lost a stone in weight in a year, but there had been no appreciable loss during the last three months. Four months ago he was admitted to Moorfields with iridocyclitis of the left eye; there was a hazy cornea, and the anterior chamber was full of a whitish substance. The eye was excised. A section of it was shown. The anterior chamber was filled with cellular and fibrous material, and iris and ciliary body were practically destroyed. Last month a part of the conjunctiva of the right eye was excised, and that showed a fairly typical tubercle formation. Two small glands from behind the ear were excised, and the material crushed and given to a guinea pig, but beyond a local reaction it produced no definite illness. The glands showed marked fibrous tissue formation, indicating that the process must have been very chronic.

Mr. MAYOU and Mr. HARRISON BUTLER thought it likely that the cyst case was spring catarrh, and advocated a further test for eosinophilia.

Mr. LINDSAY REA exhibited a case showing the result of a Poulard operation for **ptosis,** and one of **angioma of the retina.** With regard to the case of angioma, he referred to the similar case examined by Mr. Collins and described in the Ophthalmological Society's *Transactions* in 1892 and 1894. In the present case there was a large white mass over the macular area, and a large vein ran down the disk. The growth appeared to be pushing the retina in front of it.

With regard to the case of ptosis, he chose the Poulard operation in preference to a Motet, because it was then all in front of one, and one could see exactly how much to open the eye.

The CHAIRMAN, speaking of the angioma case, said this condition must be of great rarity. The white masses in the fundus in this case must be decolorized blood-clot, which was being gradually absorbed, like the "melting-snow" variety seen in cases of large sub-choroidal hemorrhage. As to the case of ptosis, he pointed out the difficulty of everting the lid after a Motet operation if a foreign body got into the eye. He himself favored the Hesse operation for ptosis.

Mr. TREACHER COLLINS did not consider angioma of the retina such a very rare condition; he spoke of several cases he had seen. With regard to the ptosis case, he preferred the

Motet to the Poulard operation; he had done the former three times, and the results pleased him greatly. The present patient could not completely close his eye, so that it was probably open during sleep; but with a Motet complete closure was ensured during sleep.

Mr. R. G. DOYNE exhibited a case of **congenital malformation** of iris and anterior chamber. The iris showed an absence of anterior layers in many places, and there was a hole in each eye through which the red reflex could be obtained. In the left eye the fibers of the suspensory ligament could be seen. Also the angle of the anterior chamber was malformed and appeared to be filled with whitish substance, and strands could be seen running from the posterior surface of the sclero-corneal junction to the anterior surface of the iris, and the margin of the cornea was opaque. The child was highly-strung, but not particularly backward.

The CHAIRMAN referred to a case he once had in hospital of a man with nine pupils, one of them almost central, the other eight ranged peripherally. Eventually he developed glaucoma, probably having a relation to the congenital defect in the development of the angle of the anterior chamber, but there was no congenital defect in the iris.

Mr. MAYOU and Mr. COLLINS discussed the probable causation of coloboma with bridge, Mr. Collins stating his opinion that the mesoblastic portion of the iris had two sources of origin; the anterior layer of the fibro-plastic sheath and the blood vessels which grew forwards from the periphery of the anterior ciliary arteries beneath the pupillary membrane.

The New Psychology and Problems of Vision

An elaborate paper on **the new psychology in its relation to problems of vision** was read by Dr. CHARLES F. HARFORD. He says that the attention of the ophthalmologist has hitherto been mainly directed to the anatomical and physiological aspects of problems of vision. In his book on *Disease of the Eye*, Parsons said, after tracing the processes of vision from the external object to the cortex cerebri, "Here the nervous impulse is transformed into a psychic impulse, which is not, and probably never can be, understood." Dr. Harford claims

that psychology can offer an important contribution to supplement physiology, and that psycho-analysis throws new light upon human thought. Many are studying psycho-pathology without having grounded themselves in normal psychology, and his object in this paper is to formulate a scheme of the working of the "Psyche" which might help to interpret many of the problems of vision. He exhibited diagrams representing the mechanism of the Psyche, divided into three sections: cognition, affection (standing for the emotional result of cognition), which led to action; secondly he showed a disk presenting the field of consciousness, which would present to the Psyche the visual and other images from external objects or from the memory. His third diagram showed six compartments which he referred to as the store-chambers of the Psyche, namely, results of careful observation, results of casual observation, amnesia of common life, pathological repression, infantile impressions, and instinctive and hereditary factors. Emphasis was laid by the author on the emotional part of the Psyche, that which activates each mental concept, which Bergson called the "energie spirituelle." He proceeded to deal with the factors of repression, association, dissociation, and apperception. He said the vision of the infant is only gradually evolved, not because of any organic defect of structure, but because of the gradual nature of the awakening of the intelligence. Strange objects, seen for the first time by normal adults, could not be recognized until they could be related to some previous visual memory.

Mr. ARNOLD WILLIAMSON read a paper on **two cases of thrombosis of a retinal vein, one showing a hole, the other a star at the macula.** He first referred to the careful paper on holes in the macula published by the late Mr. Coats, in which he summarized the various theories of causation. Monteith Ogilvie considered there were two factors concerned: the fact that the retina is thinnest at the fovea, and thicker around it than elsewhere, and the fact that waves of disturbance passing through the eye meet at the posterior pole and tear the fovea by "contre coup." Fuchs attributed it, in traumatic cases, to mild traumatic retinitis, the slight serous exudate rupturing the membrane limitans externa, so causing

the appearance of a macular hole. Coats believed œdema was the underlying cause, stating that a hole had never appeared less than 60 hours after the injury, also that opacity in the retina had been observed after injury in a case in which a hole subsequently developed. In 1908, however, Kipp and Alt published in the *American Journal of Ophthalmology* a case in which a boy was shot through the orbit, tearing the optic nerve and its sheath, and entering the skull. On the following day the retina was whiteish, and vessels narrow, except for a vein passing from macula to disk. At the macula was a red deep round spot, one third D.; two days later the retina was more opaque. Four days later the eye was excised, and there was a large hole at the macula, surrounded by swollen retinal tissue. There was evidence of œdema everywhere. Kipp and Alt consider that the retina at the macula can be torn by contre coup. Mr. Williamson showed slides of this case of his because they made clear the dependence of the formation of a hole in the macula on the occurrence of subretinal œdema associated with thrombosis of the central retinal vein. The patient was a woman aged 62, whose sight began to fail 14 years ago. For two years, until excision of the eye in July last, she had continual pains in the head. The eye was excised because of absolute glaucoma. Thirty years ago she had a fall, blacking both eyes, but the sight was not impaired. The excised eye showed a corneal nebula, a cellular exudate adherent to the posterior surface of the cornea in places. Hyaline exudate passing round the lens and causing some adhesion of the iris to it. There was no cupping of the disk. He exhibited sections on the screen by means of the epidiascope. There was an absence of the inner nuclear layer and inner reticular layer, and the retinal pigment layer was separated from the inner layer of the choroid. There was also some œdema in the outer molecular layer of the perimacular region. The special point was, that the cyst was formed not in the retina, but in the accumulation of œdematous material between the membrana limitans externa and the retinal pigment layer. In consequence of the presence of this cyst the outer layer of the retina appeared to undergo a degenerative process, so allowing of the formation of a hole.

The second case was also discussed at length, and sections

exhibited and demonstrated. In both cases there seemed to be a toxic influence, as shown by the iridocyclitis, acting on the retinal veins and producing thrombosis, and acting on the delicate macular choroidal capillaries, causing degeneration of their walls, increased permeability to fluid, and hence œdema; this fluid then osmosed through the potential space between the rods and cones and the pigment epithelium, preventing the access of nutrient materials from the choroido-capillaris, so that the superjacent retina degenerated and formed a hole.

Mr. M. S. MAYOU, discussing the paper, showed, by the epidiascope, sections from a typical case of albuminuric retinitis which he had some years ago. Here exudation was seen in two places: inter-retinal exudation, and sub-retinal exudation. He believed the albuminous fluid in the layers of the retina was derived from the retinal vessels, but the sub-retinal fluid he thought came from the choroid. The two had a different consistence and response to the staining reagent.

On Friday, December 9, 1921, this Section held a Clinical Evening, the President, DR. JAMES TAYLOR, C. B. E., occupying the Chair.

Hyaline Bodies in Disk, with Night-blindness.

Mr. MALCOLM HEPBURN showed a patient with this condition of hyaline bodies in the disk, the interesting feature being the associated night-blindness. Sometimes these bodies were seen with pigmentary degeneration of the retina, but in this case there was none of the latter. Possibly there might be retinal degeneration without pigment, but in all cases of such degeneration there was a ring scotoma, and this case had not one. The fundus was of the albinotic type, and his brother, who was under the care of Mr. Treacher Collins at Moorfields, had a similar kind of fundus. The exhibitor had never yet found the symptoms of night-blindness in an albino. The patient was also a myope, and true night-blindness was sometimes found in myopes. The night-blindness in this case he regarded as a coincidence.

Macular Mass, for Diagnosis.

Mr. C. LONGWORTH BLAIR showed a man with a mass at the macula, of uncertain nature and origin. For 2½ years there had been difficulty in seeing with that eye.

Mr. RAYNER BATTEN mentioned a case of his own in which there was a mass in the middle of the macular region, and it definitely followed scarlet fever and ear trouble. During the year he had been watching the case there was no increase in the size of the mass; indeed the retina had latterly been more healthy looking. He thought it was inflammatory, also Mr. Blair's case.

Mr. J. H. FISHER thought there was little evidence of inflammation, but that there was a cystic element in the case.

Mr. M. S. MAYOU spoke of a case with a similar appearance he had now under care, a child aged 12, who had a good deal of keratitis punctata, and there were enlarged tubercular glands in the neck, proving the case to be inflammatory, and as such he regarded Mr. Blair's case.

Cyst of Iris.

Mr. R. R. CRUISE showed a case of this nature, as to which there was no history ascertainable as to inflammation or injury. His inclination was to regard it as a retention cyst associated with crypts towards the base of the iris, the crypt mouths having become occluded by the continued secretion which was not being evacuated. There was an opacity of Descemet's membrane, giving to the limbus a grayish haze. The stroma of the iris seemed to be excavated, and the base of the cyst seemed to be formed by the posterior layer of the iris. The tension of the eye was normal, and there were no signs of synechiæ. It was a flattened pupil. It was necessary to think of possible increase of tension caused by the fluid, and he invited advice as to operation. There were no fundus changes to be made out.

Mr. W. H. MCMULLEN reminded members of a case of cyst of the iris which he showed 18 months ago, with very clear contents. There was no history of injury in that case either. The condition appeared to have dated back to infancy, when

the child had a cyst removed at a hospital, and it subsequently recurred. At the meeting referred to it was suggested that the child might have received a puncture wound in the eye from a secreted pin in the pillow. Cases had been seen in France in men who were exposed to fragments from exploding shells. The case he referred to was still in practically the same condition. He advocated leaving these cysts alone, because of the danger of conveying the epithelial cells where they would be a danger; moreover, if the cyst was not obviously growing it did not seem to do any harm.

Mr. M. S. MAYOU thought the difficulty was that when the cyst collapsed the edges came together again and formed a fresh cyst round the margins of the old one. In one case the eye of which he examined in the Pathological Department, operation had been done and very acute iridocyclitis followed. For this the patient did not come to hospital, and sympathetic trouble developed in the other eye, and it went quite blind. In another similar case the eye had to be removed. He agreed with Mr. McMullen that they should be left alone.

Mr. HINE mentioned a similar case of his own, in which his passive attitude received support.

Mr. J. H. FISHER objected to the impression going out that operation on these cysts was attended with danger subsequently. He thought Mr. Cruise's case was one of retention cyst, and considered that puncture promised success.

Coloboma of Optic Nerve

Mr. J. F. CUNNINGHAM showed a patient with coloboma of the optic nerve, which he considered was traumatic. The eye was highly myopic, and there was no perception of light. No history of injury could be gleaned, however.

Mr. HEPBURN'S view was that the case was congenital. In all the cases of the kind he had seen in which there was trauma, there was a great development of fibrous tissue, and often heaped-up pigmentation, features which were absent from this case.

Mr. MAYOU suggested it was probably a birth injury. He did not think there was always necessarily a mass of fibrous tissue in front of the nerve after evulsion of it; certainly if the

nerve head was torn out from the scleral foramen such a fibrous mass did not necessarily occur.

Sclerosing Keratitis.

Mr. LINDSAY REA showed a case with this condition, which came on very insidiously, without any noticeable inflammation. The Wassermann test was negative, and tubercle did not appear to come into the picture, but she had three very bad teeth, which he considered were the cause of the trouble, and they were being removed.

Restoration of Lower Lid after Gunshot Wound.

Mr. M. W. OLIVER, who is working at the Sidcup Hospital, showed an ex-officer whose lower lid was carried away and the eye destroyed by a gunshot in the war, and who was anxious to wear an artificial eye. He described by means of slides the grafting he did, and illustrated the various stages, emphasizing the importance of lining the flap.

He was congratulated on the result by the President and Mr. Goulden, the latter remarking that in a case he did he did not line the flap, not knowing its importance, and the result was quite satisfactory notwithstanding.

Motais Operation for Congenital Ptosis.

Mr. R. AFFLECK GREEVES showed a patient on whom he had performed a Motais operation for congenital ptosis; he intended doing the same for the other eye. He was complimented on the result by the President and Mr. Cruise, the latter referring to a similar case in which he did the operation, with excellent results. He remarked on the successful closure of the eye during sleep, despite the fact that the innervation of the muscle pulling the eye upwards was the same as for that which pulled the lid upwards, the orbicularis obviously overcoming the action of the other.

REPORT OF THE PROCEEDINGS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. CONRAD BERENS, Jr., Secretary.

MEETING OF NOVEMBER 21, 1921. DR. L. W. CRIGLER, CHAIRMAN.

Dr. Talbot R. Chambers read a paper on **trifocal lenses** which appears in this issue.

Discussion: Dr. Claiborne said a bifocal lens was presented by him before the Am. Ophth. Soc. and several times before this Section. The glass suggested by Dr. Chambers bears a striking likeness to his in that the kryptok disk is imbedded in the foundation glass. Dr. Claiborne placed a paster on the concave side of his foundation glass so that the distance correction was above the kryptok and the near glass was the combination of the paster plus the kryptok. He does not know whether Dr. Chambers was aware of his work in this matter or not. Dr. Chambers claims to have added another focus to his glass for intermediary distances between far and near. If this can be done successfully it is a great addition, but the glass first suggested by Bausch and Lomb and later perfected by Dr. Claiborne was the basis of the suggestion of Dr. Chambers.

Dr. Chambers, in closing, stated the cost would probably be half more than an ordinary bifocal kryptok. It could only be made by a high grade mechanic and it is necessary to provide a cemented wafer for protection in the grinding and this is thrown away on completion of the job. There is no chromatic nor prismatic aberration as shown by sample displayed.

Dr. H. H. Tyson showed a young man, 28 years, with a

pituitary struma who was presented before this Section on March 17, 1919, as one with a recurrence of the growth after an operation for its partial removal two years before by Dr. Harvey Cushing of Boston, on account of poor vision in his right eye with visual fields indicating pressure on the optic chiasm. Doctor Cushing made a right transfrontal osteoplastic exposure with partial removal of the pituitary struma which he described as a soft reddish mass protruding between the legs of the chiasm. Portion removed was *2cm* in diameter. He remarked at the time that it was surprising that the left nerve was not the more damaged of the two as it was pushed far to one side.

Vision previous to operation was O.D. = p.l., O.S. $\frac{1}{10}$ with bitemporal hemiachromatopsia; six weeks after operation vision was O.D. $\frac{10}{10}$, O.S. $\frac{10}{15}$, and visual fields were normal. About one and one half years later vision began to fail in his left eye. He took pituitary and thyroid extracts alternately for four months. October 22, 1918, O.D. $\frac{10}{15}$, O.S. $\frac{10}{50}$.

November 12, 1918, Dr. Geo. Dixon X-rayed the sella and stated that he would be inclined to regard it as some osseous malformation rather than indicating the presence of a soft tumor. March 15, 1919, vision receded to O.S. $\frac{6}{200}$, O.D. $\frac{10}{50}$, with bitemporal hemiachromatopsia, the nasal field of his left eye being encroached upon by the blind portion to the extent of 5° from the vertical meridian with contraction of all colors in nasal field. He later visited Doctor Cushing again who advised against further operative interference. During January, 1921, he consulted Professor E. Fuchs, of Vienna, who advised radium treatment and referred him to Doctor Hirsh, of Vienna, who operated intranasally, opening both sphenoidal cavities and exposing the sella turcica as much as possible. He then applied radium rays, using an Albanus carrier containing *20mg* radium metal, giving five treatments from 7 to 9 hours each from March 7th to April 26th with no improvement. He then gave five treatments of from 13 to 16 hours each, May 17th to August 2d. He thought that there was some slight improvement in the fields, and that the trophic disturbances as regards fat had been reduced. He stated that the X-ray showed a flat sella bulging toward the sphenoidal cavities. During treatment when radium was filtered, no headache

occurred; but when applied through a less dense filter, a strong reaction followed.

His present condition of vision is R. $\frac{20}{70}$ with correction with temporal pallor of disk and temporal hemianopsia. Left eye blind with atrophy of optic nerve. Tension normal both.

Since returning from Vienna he has consulted Doctor Cushing who advised against any and all treatment and suggested watching the case as to progress:—as to the use of radium he stated that he had used it in much larger dosage than given in this case with no benefit. As to the effect of radiotherapy upon pituitary tumors, Doctor Quick in his paper read before this Section, stated that pressure symptoms were benefited but that trophic and metabolic changes were little influenced by either X-ray or radium. The case is presented as a follow-up case, being of interest on account of improvement having followed the different methods of treatment; viz., operation, gland extracts, and radio-therapy; with a relapse or recurrence after each; and the ultimate condition being the most unfavorable of any. The vision in these cases depends upon the site of the tumor and the direction of the pressure taking into consideration the individual tissue tolerance to pressure.

DISCUSSION.

Dr. Sinclair Tousey: In a case of tumor of the pituitary body we may as in this case perform an operation which enables one to place the radium in contact with the tumor. This secures for the pituitary body the wonderful effect almost always produced by radium in lesions at or near the surface. Wherever the lesion can be seen and felt radium produces marvelous benefit as in a case of tumor of the orbit which Dr. Bell and I showed at a meeting of this Section a couple of years ago, a tumor about as large as an orange, diagnosed as sarcoma, completely and permanently disappearing.

Without an operation radium could be less effectively applied to the pituitary body than the X-ray.

A recent improvement in the X-ray apparatus and technique makes it possible now to secure five times as much deep effect as formerly without increasing the surface effect. For the

X-ray treatment of the pituitary body at a distance of several inches from the nearest surface this increased penetration means that combined with our regular system of cross-fire we are able to apply as much X-ray as we desire to the pituitary without any skin or scalp effect. It is now no longer a question of how much X-ray we can apply to the pituitary with safety to the surface tissues, but simply a question of how much we wish to apply. The cross-fire system of X-ray thereby is making a series of applications of the X-ray through different small portions of the surface, protecting all other portions with heavy sheet lead. The applications all converge, at the pituitary gland for instance, but each part of the surface is only exposed once in the whole series.

Dr. CUTLER presented a patient with **gyrate atrophy of the retina and choroid.**

P. C. is a man of robust appearance, with no history of consanguinity or eye diseases in his family. No previous illness of consequence. Wassermann negative.

Noticed failure of vision in childhood, which has progressed slowly but steadily. The chief symptoms are near-sight and night-blindness.

Vision:

O.U.: $-6 = \frac{30}{100}$; Jaeger 2 at 4 inches.

Eyes externally normal. Pupils equal and react well. Posterior polar cataract.

Nerves and retinal vessels fairly normal. Large posterior staphyloma.

The atrophy of the retina, and partial atrophy of the choroid, is so like that described by Prof. Fuchs although less advanced than in the three cases reported by me from his notes in 1895, that I ventured to group it with them as regards its appearance. It has not, however, the characteristic feature that led to the inclusion of gyrate atrophy in the class of familial atrophies and degenerations, of which retinitis pigmentosa is the type.

It is possible that we shall find later that retinitis pigmentosa is a chronic infection to which some families are more susceptible than others, rather than a "degeneration," which, after all, begs the question.

In this case the most conspicuous source is the teeth, which are, and have long been, very bad.

Very few cases resembling this have been reported. Prof. Fuchs stated that he had not seen one like it since the group reported in 1895 and 1898, above mentioned.

DISCUSSION.

DR. CLAIBORNE said that he had seen the case before and thought it most interesting. He thought the term gyrate atrophy incorrect, not descriptive and deceptive. The arrangement of the choroiditis should be more properly described as invicted or looped, a term borrowed from heraldry. He suggested invicted or looped instead of gyrate.

Dr. L. W. CRIGLER: **Traumatic expulsion of lens in capsule.** A man, G. L., age 23, who on July 14, 1921, while walking in front of a glass window stepped on something which caused his foot to slip. In attempting to regain his balance his elbow struck the glass, breaking it. A sharp particle penetrated the left eye, at the same time lacerating his upper and lower lids. He received first aid at the hands of a general practitioner, who not being satisfied with the intraocular condition, referred him to the Manhattan Eye and Ear Hospital, where he was seen three days after the injury.

The lid wounds were of minor significance. The eyeball presented evidence of a linear incision in the cornea just anterior to the limbus, and parallel with it, in its lower outer third. There was a wide coloboma of the iris with no protrusion of its pillars through the wound. There was some blood in the anterior chamber which masked the fundus reflex. Two days later, however, a perfect view of the fundus could be had. The lens and its capsule were absent from the eye; the optic nerve and retina were distinctly seen with a +10 diopter lens. It was therefore concluded that the lens must have been expelled in its capsule at the time of the injury.

Recovery was uneventful, the wound healing smoothly with no protrusion of iris tissue. The patient left the hospital at the end of the third week with a corrected vision of $\frac{10}{10}$.

The scar in the cornea, now four months since the accident, is barely perceptible. Aside from the enlarged, asymmetric

pupil, there is no deformity. The eye is free from inflammation, and the patient's only complaint is absence of binocular single vision and the annoyance of too much light entering the eye.

Dr. Crigler said that the uniqueness of this case reminded him of the one reported by Prof. Fuchs in his textbook of an elderly man who was gored, first in one eye, and at a later period, in the other, by a bull, sustaining a rupture of the sclera and expulsion of the lens in each instance. Later, with the aid of lenses, the man obtained useful vision with both eyes.

Dr. Knapp presented a case which resembled **late infection after trephining.** The patient, 51 years of age, was operated on in May, 1919, for chronic glaucoma. Trephining was performed on the right eye and a Lagrange operation on the left eye.

Distinct filtration was established in both eyes, and the convalescence was uninterrupted. Two months later the patient returned with an inflammation in the right eye; ciliary congestion, pupillary exudate, and hypopyon. A vitreous abscess developed and the eye subsequently shrunk. The epithelium covering the cystoid scar was intact and there never was any conjunctivitis.

The condition differed from that usually found in late infections, and upon inquiry it was elicited that two teeth in the right upper jaw had been extracted two days prior to the inflammation in the eye. This suggests a possibility that the inflammation may have been an endogenous one.

DISCUSSION.

Dr. Davis asked Doctor Knapp if he could explain why the eye which had been trephined was infected, and the one which had the Lagrange operation (the two operations having been performed two days apart) was not infected? That is, does he consider it simply a coincidence, or that there was some special reason for it?

Dr. Knapp in reply said that the affected eye was on the same side as the infected teeth.

Dr. KNAPP presented a specimen of a **glioma of the retina** which had perforated through the cornea.

The case occurred in a child aged three, who came to the hospital with an irregular granulating area in the center of the cornea which looked like the granulations which occur from a perforation following panophthalmitis of moderate degree.

On opening the eye, the condition was immediately recognized as that of glioma. The present condition must have been in some way or other preceded by an ulcerative destruction of the cornea.

Dr. CLAIBORNE reported a case of **sarcoma of the choroid**, which was discovered on routine examination for glasses.

Dr. WALTER B. WEIDLER presented a patient with **solid-œdema of the face.** This disease was first described by Sir Jonathan Hutchinson and affects the skin of the cheeks, lips, and eyelids, sometimes accompanied with a conjunctivitis of the bulbar and tarsal conjunctiva and at times episcleritis.

CASE HISTORY.—Mary G., age 20, Jewish, family and personal history negative. Present trouble: about twelve years ago awoke in the morning with face swollen and red. This was more or less confined to cheeks, lips, and eyelids. Was treated at Mt. Sinai Hospital with no improvement following. She left school about four years later because of the deformity and the recurrent attacks. The swelling has never at any time completely disappeared. Was treated at various clinics and the diagnosis, as well as she can remember, was "chronic erysipelas." She has also been treated as a case of acromegaly. When first seen at the Manhattan Eye and Ear Hospital about six months ago, there was great swelling of the cheeks, lips, and the right upper and lower eyelid. Some eczematous eruption about the outer canthus, with photophobia and lacrimation. Redness and congestion of tarsal and bulbar conjunctiva, with small granular deposits at the corneo-scleral margin. A culture from the nose revealed a pure growth of staphylococcus pyogenes albus. A vaccine was made and given and the swelling of the eyelids and active inflammatory symptoms subsided. The swelling of the face has not as yet been much affected by the treatment, which, however, is being continued and was followed by cure in the two other cases reported by Dr. Weidler in the *Trans. Am. Oph. Soc.*, vol. xvi., 1918.

DISCUSSION.

Dr. A. TENNER said the patient was seen five years ago at the Mount Sinai Hospital. Dermatologists thought it was a lymphatic condition, that is, an occlusion of the lymphatics such as occurs in elephantiasis. Elephantiasis, though most commonly affecting the leg, may affect the face. During the period she was under Dr. Tenner's observation the condition showed a tendency to partial subsidence for a time, to be followed by an exacerbation; one must be skeptical about the results of treatment until the case has been watched for a long period so as to be assured that the present improvement is more than a temporary one.

If one can properly class such cases as an elephantiasis, there seems to be no necessity for the addition of a new term to our already overburdened nomenclature.

Dr. WALTER B. WEIDLER showed a patient, with **asteroid bodies in the vitreous,** aged 54, Jewish, who had glaucoma of the left eye eight years ago. An iridectomy was done on this eye, but it was enucleated later on account of pain. The right eye has never had any glaucomatous signs or symptoms. The ophthalmoscopic study of the right eye at that time showed the following:—O.D., disk oval, 7 × 8*mm*, long axis 90 degrees, floating opacities, cholesterin crystals in the vitreous, small and not in great numbers. The rest of the fundus was normal.

The patient has been under observation for a matter of eight years or more and during this time these opacities increased in number and size. At the present time the vitreous is fairly well filled with large round and oval-shaped bodies varying in size from 2 × 2*mm* to 3 × 4*mm*. They are quite luminous and in places appear in chain-like formations. It may be possible that these asteroid bodies are the later stage of the cholesterin crystal formation after some chemical change has taken place in the vitreous.

Dr. ISAAC HARTSHORNE showed a patient with **lymphosarcoma of the orbit,** with involvement of the eyeball. Exenteration of the orbit followed by radium and X-ray treatment. Recurrence.

Dr. S. A. AGATSTON: **Iritis following advancement operation.** J. B., girl, 18 years of age. Family history negative. No history of any previous inflammation. She came to Bellevue Hospital for the correction of her convergent squint. A Reese resection and tenotomy was performed on her left eye. There was not any unusual reaction after the operation. Nine days after the operation the patient developed iritis. Wassermann negative. Teeth are in bad condition; X-ray of the sinuses was suggestive of sinusitis of the left frontal, ethmoidal, and maxillary sinuses. It would appear that the traumatism of the operation acted as a predisposing cause to this manifestation of a focal infection.

DISCUSSION.

Dr. L. W. CRIGLER said that the lesson in this case impresses upon us the importance of eliminating all recognizable foci of infection before operating, the procedure becoming a more impelling one, if the eyeball is to be opened.

Several years ago he reported a case of interstitial keratitis following advancement of the externus. Blood examination revealed the presence of syphilis in the mother and three other children as well as the patient.

REPORT ON THE PROGRESS OF OPHTHALMOLOGY.

Abstracts by Drs. A. N. Alling, New Haven; M. J. Schoenberg, New York; T. H. Butler, London; P. G. Doyne, London; and K. Wessely (*Archiv f. Augenheilkunde*), Würzburg.

Edited by Matthias Lanckton Foster, M.D., F.A.C.S., New Rochelle, N. Y.

I.—THE EYE IN ITS RELATIONS TO GENERAL DISEASE.

1. Bartels. **Eye symptoms in encephalitis lethargica.** *Klin. Monatsbl. f. Augenheilkunde*, July, 1920, p. 64.

2. Böttner. **Increase of spinal pressure and classification of the true forms of polycythæmia, with reference to the changes in the fundus.** *Deutsche Arch. f. klin. Medizin*, cxxxii., p. 1.

3. Friedenwald, H. **Ocular conditions associated with arthritis deformans.** *American Journal of Ophthalmology*, June, 1921.

4. Hogue, G. I. **Ocular manifestations in encephalitis lethargica.** *Ibid.*, August, 1921.

5. Rohde. **Diagnostics of diseases of the cerebellum.** *Neurol. Zentralbl.*, 1920, xxxix., p. 423.

6. Schröder. **Encephalitis lethargica.** *Deutsche med. Wochenschrift*, 1920, p. 1042.

7. Waardenburg, P. J. **Ocular disturbances in encephalitis lethargica.** *American Journal of Ophthalmology*, August, 1921.

8. Zethelius and Wersen. **Treatment of methyl alcohol poisoning, particularly as regards the visual disturbance, with lumbar puncture.** *Klin. Monatsbl. f. Augenheilkunde*, 1920, p. 51.

Bartels (1, **Eye symptoms in encephalitis lethargica**) says that the ptosis is most distinct when the encephalitis is most marked. Of the extrinsic muscles he observed paralysis of those acting vertically. The symptoms referable to the internal muscles he found to consist of paresis of the accommodation and inhibition of the pupillary reaction without paralysis of the sphincter. The ophthalmoscopic picture was usually normal, but retrobulbar neuritis was present in one case.

SCHRÖDER (6, **Encephalitis lethargica**) emphasizes the exceeding variability of the symptoms and of the course of this disease. Lethargy, a symptom of disease of the deeper parts of the brain, is present in only part of the cases. Frequently the symptom complex seems to indicate some other disease of the central nervous system. Four of six cases observed had very transient pareses of the external muscles, one had choked disk, and one incomplete optic atrophy.

HOGUE (4, **Ocular manifestations in encephalitis lethargica**) states that twenty-six deaths from this disease were reported in 1920 in the State of Wisconsin. In the first three months of this year thirty-one deaths have occurred. He places the eye symptoms in the following order of frequency: diplopia, ptosis, impaired accommodation, nystagmus, sluggish pupils, optic neuritis, papillœdema. He relates the histories of four cases.

ALLING.

WAARDENBURG'S (7, **Ocular disturbances in encephalitis lethargica**) paper is an exhaustive discussion of ocular signs of this disease based upon a study of cases published in Dutch literature together with two cases of his own. It does not lend itself to satisfactory condensation.

ALLING.

Arthritis deformans is now commonly regarded as due to chronic toxemia incidental to some local infection. FRIEDENWALD (3, **Ocular conditions associated with arthritis deformans**) describes four cases in which the eye lesions may be explained on this basis although whether they are dependent on the constitutional condition or not it is impossible to prove. There was one case of scleritis and marginal ulcers in the other three.

ALLING.

The first case of disease of the cerebellum reported by ROHDE (5, **Diagnostics of diseases of the cerebellum**) was one of shot wound behind the right ear. At first only disturbances of the cranial nerves caused by a fracture of the base of the skull were observed, and the complex of cerebellar symptoms was apparently not recognized. The left pupil was larger than the right, the reactions were intact, there was marked nystagmus up and to the left, paresis of the right abducens, no corneal or conjunctival reflex, facial paralysis, excessive movement of

the right hand to the right. The X-ray showed fissures of the base between the middle and posterior fossæ, two little foreign bodies, and a large hemorrhage at the base of the posterior fossa. In the second case the symptoms were at first uncertain, but finally indicated a tumor in the left angle between the cerebellum and the pons. The pupils were moderately dilated and reacted slowly to light; paresis of the abducens appeared first on the right side, then on the left; nystagmus appeared when the eyes were turned to extremes, most strongly when turned to the right; the left conjunctival and corneal reflexes were weakened. There was a marked choked disk on each side; a sector-like defect of the left field upward and outward; the vision of the right eye was reduced to movements of the hand, that of the left to $\frac{3}{5}$. In addition other symptoms referable to the cerebellum were present. Two operations failed to find the tumor, but on autopsy a cyst was found in the left hemisphere of the cerebellum along with remains of an endothelial sarcoma.

BÖTTNER (2, **Polycythæmia**) reports four cases of this disease which presented no signs of stasis, no enlargement of the heart, no choked disk, and only moderately increased pressure of the spinal fluid. In the fundus he found only broadened and dark veins. Two other cases had the symptoms which were absent in the first group. He believes the disease to pass through three stages: (1) an early stage characterized only by the blood picture; (2) a middle stage with marked polycythæmic symptoms; (3) a final stage with venous stasis and decompensation of the heart. A special fundus condition appertains to each stage: dilated vessels without discoloration of the papilla at first, greater dilatation, especially of the veins, with redness of the papilla later, and finally choked disk. The choked disk is not from a local cause, but from increased intracranial pressure consequent upon the hyperæmia of the brain, which also causes the increased spinal pressure.

In a case of methyl alcohol poisoning in which lumbar puncture was practiced for diagnostic purposes, ZETHELIUS and WERSEN (8, **Treatment of methyl alcohol poisoning with lumbar puncture**) observed a considerable improvement in the vision after this procedure, and complete recovery after the second puncture. Improvement was then noted in six other

cases after lumbar puncture, although in most it was only slight.

II.—OCULAR DISEASES, REMEDIES, INSTRUMENTS, AND OPERATIVE TECHNIC.

9. BELL, G. H. **New method of preventing postoperative intraocular infections.** *Journal A.M.A.*, October 1, 1921.

10. BRENNECKE. **The action of parenteral injections of milk upon diseases of the eye.** *Klin. Monatsbl. f. Augenheilk.*, August-Sept., 1920, p. 419.

11. FISCHOEDER. **Injuries of the anterior segment of an eye subjected to the X-rays because of a sarcoma of the choroid.** *Zeitschr. f. Augenheilk.*, xliv., p. 160.

12. HASSEL. **Protein body therapy in ophthalmology.** *Deutsche med. Wochenschrift*, xxix., p. 819.

13. HOLLER. **Protein body therapy.** *Zeitschr. f. Augenheilk.*, xliv., p. 145.

14. MASCHLER. **Experiences with injections of milk.** *Ibid.*, xliv., p. 184.

15. OLSHO, S. L. **Electrically tinted optical glass.** *American Journal of Ophthalmology*, September, 1921.

16. PILLAT. **The effect of parenteral injections of milk in gonorrheal ophthalmia of the human eye.** *Zeitschr. f. Augenheilk.*, xliv., p. 178.

17. ROCHAT. **Akinesia in eye operations.** *Klin. Monatsbl. f. Augenheilk.*, August-September, 1920, p. 177.

18. V. SZILY. **The blind spot utilized to reveal simulation of monolateral blindness.** *Ibid.*, July, 1920, p. 1.

19. WRIGHT, R. E. **Blocking of facial nerve in cataract operations.** *American Journal of Ophthalmology*, June, 1921.

BELL (9, **New method of preventing postoperative intraocular infections**) reports four hundred operations without a primary infection. His method consists in dropping of a one per cent. silver solution into the eye two hours before operation. He thinks that the silver, by stimulation, produces a leukocytosis and protective substances are formed which take care of the microörganisms if any are present, hence he does not hesitate to operate even if the smears show bacteria. He further emphasizes the importance of what he calls the three T's—teeth, tonsils, and toxemia as the cause of infection.

ALLING.

WRIGHT (19, **Blocking of facial nerve in cataract operations**) has used this method in one hundred cases known as

"squeezers," who seem likely to make trouble. He injects two per cent. novocaine along the trunk of the facial nerve and is greatly pleased with the accompanying flaccidity of the orbicularis.

ALLING.

FISCHOEDER (11, **Injuries of the eye by the X-rays**) reports a case of sarcoma of the choroid, for which X-ray treatment was tried, after enucleation had been declined, in spite of the poor prospect of success shown by previous experiences. The treatment consisted of two series of irradiations, each of ten in fifteen days, concentrated from various directions upon the globe, the superficial dose at each sitting being 300 units, and the tumor, situated an average distance of 10*cm* beneath the skin, received from 600 to 750 units in each series. No influence was observed to have been exerted upon the tumor, but changes were produced in the anterior segment of the eye. Eight days after the conclusion of the second series a conjunctivitis appeared together with punctate opacities in all the layers of the cornea, which seemed to be minute infiltrates and gradually passed away. On the twenty-first day after the end of the treatment small, white, granular opacities appeared in the epithelium and quickly disappeared. No histological explanation is given of this last condition, which has not hitherto been known. Although the corneal opacities disappeared and the lens remained clear, the vision remained greatly impaired, so it is thought that the retinal elements also were harmed.

According to MASCHLER (14, **Experiences with injections of milk**) there were treated in this manner 36 cases of iritis, 21 of infection and irritation of the iris after injury, 11 of postoperative infection, 24 of corneal ulcer, 6 of serpiginous ulcer, and 3 of late infection after Elliot's operation. The best results were obtained in the cases of postoperative and posttraumatic infection; in 17 out of 42 of these the infection was overcome by the milk treatment. The results were very good in the cases of acute iritis also, although recurrences not infrequently made renewed injections necessary. He often obtained good results in torpid cases of tuberculous iritis, and likewise in corneal ulcers which were not serpiginous, especially those of eczematous origin. The absorption of large intraocular hemor-

rhages was hastened several times by the milk injections. On the other hand the treatment was inefficacious in trachoma and parenchymatous keratitis. It is to be added that along with the good, often brilliant, results, unexplained cases of complete failure occur. It is also to be noted that occasionally infiltrates appear at the places of injection, that the fever may last as long as three weeks in feeble, and particularly in scrofulous, children with no explanation to be afforded by any internal condition, that in cases of latent tuberculosis the process in the lungs occasionally flares up after the injection, and that in deep ulcers the stormy melting away of the tissue following the injection may frequently lead to perforation.

PILLAT (16, **Effect of parenteral injections of milk in gonorrheal ophthalmia**) sought to learn whether it is possible to cure gonorrheal ophthalmia by the intragluteal injection of from 2 to 10*ccm* of fresh milk which has been boiled for three minutes as an exclusive treatment. Twelve out of seventeen cases responded promptly. The gonococci disappeared within eleven days. Pillat recommends an injection on the first and second days, treatment with silver when the swelling subsides, and if gonococci are still demonstrable, injections on the fourth and fifth days. The discharges must be kept washed away of course. He considers the rise of temperature, to which gonococci are particularly sensitive, to be the efficient agent, but adds that recoveries were observed with a temperature of 38° and that the gonococci persist longest in the specially protected retrotarsal folds.

HASSEL (12, **Protein body therapy in ophthalmology**) dealt with natrium nucleinicum, particularly Merck's preparation called deuteroalbumose. This he used in the form of a 10% watery solution as an intragluteal injection, given from one to three times at intervals of one or two days, the daily dose not exceeding 0.6. The diseases treated were eczematous conjunctivitis, severe catarrhal conjunctivitis with involvement of the cornea, and gonorrheal ophthalmia. No effect was produced on the eczematous diseases of the eye. In some cases of grave purulent breaking down of the cornea in catarrhal conjunctivitis a very striking improvement immediately set in, so that the result was unexpectedly good. Likewise in some of the gonorrheal cases there was a striking improvement

after the injection, usually associated with fever. When this treatment was instituted early in purely conjunctival gonorrheal blenorrhea, the disease did not attack the cornea. On the other hand in some cases in which the cornea was badly involved, perforation could not be prevented by the injections. Hassel leaves the question open whether the febrile general reaction has a special importance, and explains the action of this form of treatment as due to an increased serous excretion from the conjunctiva and the consequent washing out of the products of inflammation together with an increased power of resistance on the part of the epithelium induced by the hyperæmia. He recommends in gonorrheal ophthalmia deutero-albumose with thorough lavage with physiological salt solution, and the avoidance of local antiseptics.

BRENNECKE (10, **Action of parenteral injections of milk upon diseases of the eye**) found the injection of 5*ccm* of whole milk boiled for four minutes efficient in scrofulous ophthalmia, iritis from various causes, and gonorrheal ophthalmia, partially efficient in choroiditis and infected perforating wounds, and inefficient in trachoma and parenchymatous keratitis. He warns against its use in serious tuberculosis, as in such cases a latent focus may again blaze up.

HOLLER (13, **Protein body therapy**) opposes the use of milk because it varies much in composition and incurs the danger of a fatal anaphylaxis. The deuteroalbumose now put out by Merck is not chemically identical with the original and is not as efficient.

V. SZILY (18, **The blind spot utilized to reveal simulation of monolateral blindness**) places the patient opposite a wall on which are three round spots at equal distances apart, and has him hold a sufficiently large screen in the middle line between the eyes. When he fixes on the middle spot he will see at the same time the right spot with the right eye, and the left spot with the left. If his right eye is blind, he cannot see the right spot; this he will claim when the blindness is simulated. Now he is made to approach the wall until he sees only one spot, that is until the images of the two lateral spots fall upon the blind spots of the two eyes; take away the screen. If he is blind in the right eye he will state correctly that he can see only the middle spot and the one to its right, if he is simulating

blindness of the right eye he will state that he cannot see the one to the right, and so betray his simulation.

ROCHAT (17, **Akinesia in eye operations**) has often used the temporary paralysis of the orbicularis recommended by Lint for intraocular operations with good results, and recommends it as a procedure which is frequently of very good service in operations for cataract, magnet extractions, trephinings, etc., as it obviates the danger of loss of vitreous and similar unpleasant accidents through a squeezing together of the lids. He introduces the needle of a syringe at a point a little external to the outer, lower angle of the anterior margin of the orbit, passes it upward along the outer margin of the orbit, and injects *½ccm* of a 2% solution of novocain into the muscle as the needle is withdrawn, then does the same thing along the lower margin of the orbit. A quarter of an hour later the orbicularis is so far paralyzed that there is no reflex closure of the lids. This passes off after an hour, and no injury due to lagophthalmos have been observed. Rochat has gone further and by injections of novocain into the superior recti prevented the upward rolling of the eye in cataract operations and iridectomies. After cocainizing the eye he introduces the needle into the tendon and passes it *2½cm* into the muscle; after a quarter of an hour there is no reflex rotation of the eyeball upward, although voluntary rotation remains. It is not necessary to inject the inferior oblique. Usually the sensory nerves alone are paralyzed, so that reflex movements are prevented, while the motor tract and the voluntary movements are not affected.

The glass described by OLSHO (15, **Electrically tinted optical glass**) is exposed to an electric light of very short wave length and is permanently tinted resembling the amethyst sun-tinted glass which has long been recommended for protective lenses. The visible spectrum when transmitted through this glass shows absorption especially at the violet end.

ALLING.

III.—ANATOMY, PHYSIOLOGY, AND PATHOLOGY.

20. DICKINSON, G. **Cranial development following enucleation in early youth. Possible effects in adult years.** *American Journal of Ophthalmology*, April, 1921.

21. V. DUNGERN. **The stratification theory of color vision.** *Arch. f. Ophthalmologie*, cii., p. 346.

22. GAUDISSART, P. **The ocular blood tension.** *American Journal of Ophthalmology*, July, 1921.

23. HESS, C. **Notable injury of the normal fovea by miotics.** *Arch. f. Augenheilkunde*, lxxxvi., p. 89.

24. PICK. **The influencing of vision by vesticular and ophthalmostatic disturbances of cerebellar origin.** *Zeitschr. f. d. ges. Neurol. u. Psych.*, August, lvi., p. 213.

25. URIBE-TRONCOSO, M. **The physiological nature of the Schlemm canal.** *American Journal of Ophthalmology*, May, 1921.

DICKINSON (20, **Cranial development following enucleation**) shows an X-ray of the skull. The orbit was about one half of normal size and the frontal sinus was greatly enlarged. The narrowing of the orbit was almost entirely from above downward. The patient suffered from severe neuralgia which was relieved by freeing the adhesions of the upper lid to the orbit and by cutting out the cicatricial tissue.

ALLING.

V. DUNGERN (21, **The stratification theory of color vision**) propounds a new theory. He assumes that each cone of the retina takes up all qualities of light, and that the various color sensations are produced by the perception of the light rays in its different layers. Red and green is perceived at one end of the outer limb, yellow and blue in the middle, green and violet (green is thus mentioned twice) at the other end. White is formed by the blending of the colors in each layer. This physical theory enables an easy explanation to be furnished of all anomalies of the color sense.

PICK (24, **Influencing of vision by disturbances of cerebellar origin**) reports concerning the vision of a patient in whom autopsy revealed a gliose degeneration in both dentate nuclei of the cerebellum. The abduction of each eye was limited, the double images separated both laterally and vertically, but the patient had never complained of diplopia. A frequent trouble was a film, in which flat and bodylike vision alternated and obscured the perception. Another similar symptom was a distortion in which the ceiling of a room appeared to be bulging out. He also seemed to see through the vertical walls of the room, probably due to diplopia.

GAUDISSART (22, **The ocular blood tension**) describes ex-

periments which have been conducted in order to determine the systolic and diastolic blood pressure of the retinal and choroidal vessels. Bailliart seems to have gotten most deeply into the subject. Normally we see no pulsation in the retinal arteries because the blood pressure is greater than the intraocular pressure. If the tension of the eye is increased to a point where it equals the retinal diastolic pressure, the artery will empty during diastolic and fill with each systolic. If the pressure is further increased the artery will be entirely emptied. The dynamometer is devised for the purpose of increasing and recording the intraocular pressure and this measures the blood pressure, which, for the central artery of the retina, is 30*mm* in diastolic and 70–80 in systolic. The choroidal blood pressure may also be determined with this instrument. Studies in this field are full of promise especially in pathological conditions.

ALLING.

For many years Schlemm's canal has been regarded as a venous sinus. Recent investigation however by Maggiore, Salzmann and URIBE-TRONCOSO (25, **Physiological nature of the Schlemm canal**) have cast doubt upon this view. The author dissected away the conjunctiva of the eye of a rabbit drawing out the globe and immersed it in oil in such a way that any secretion from the limbus would be collected. He found that the fluid was clear and concluded that it was aqueous humor. It has also been shown morphologically that the canal has not the structure of a vein but closely resembles a lymph channel. Salzmann by means of the slit lamp and corneal contact glass demonstrated that the region of the canal appeared as a clear zone and therefore was not filled with blood.

ALLING.

HESS (23, **Notable injury of the normal fovea by miotics**) made a very interesting entoptic observation. If one moves a little aperture, ½*mm* in diameter, in a black card rapidly back and forth in front of the pupil, the capillary system about the fovea in the normal eye becomes distinctly visible and the non-vascular area of the fovea appears shagreened. About twelve minutes after the instillation of a drop of a 2% solution of pilocarpine the capillaries begin to become invisible, and in the region of the foveal shagreen appear dark points with

bright margins, which finally form a dense mass of very dark globules. The retinal area in which this phenomenon is visible is estimated from 0.3 to 0.45*mm*. The entoptic picture lasts from one and a half to two hours. With weaker solutions the phenomenon is less marked and is delayed. If homatropin is instilled one or two hours before the pilocarpine, the phenomenon does not appear, even though the pupil is made smaller than normal by the miotic. Control experiments show that the phenomenon is independent of the size of the pupil, and of changes in the tension. Inhalations of amyl nitrite and instillations of adrenalin had no such effect. Hess ascribes it to a toxic impairment of the middle portions of the retina. The experiment shows not only how minute is the quantity of the miotic needed, but also a new way to observe the influence of poisons upon the living tissue of the retina under a considerable enlargement, and much better than is possible under the microscope.

IV.—REFRACTION AND ACCOMMODATION.

26. CLAUSEN. **The nature of myopia in the light of modern theories concerning heredity.** *Vereinig d. Augenaerzte d. Prov. Sachsen, Anhalts u. d. Thüringer Lande*, June 13, 1920.

27. EDRIDGE-GREEN, F. W. **The cause and prevention of myopia.** *The Arris and Gale Lecture.*

28. FUCHS, A. **A case of biastigmatism.** *Ophthalmic Society of Vienna*, June 21, 1920.

29. LEWIS, F. PARK. **Focal adjustment in the aphakic eye.** *American Journal of Ophthalmology*, April, 1921.

30. LOEB, C. **Why we accommodate.** *Ibid.*, April, 1921.

31. PÖLLOT. **Transient changes of the refraction of the eye in diabetes mellitus.** *Fortschritte d. Med.*, lvii, (7) p. 214.

In the effort to explain the nature of the stimulus which results in accommodation as the eye is focused for a near object LOEB (30, **Why we accommodate**) suggests that it is the passage of light obliquely through the perceptive elements of the retina from the periphery toward the center which causes the act. Light from a near object, with the eye at rest, would focus behind the retina and the rays would converge as they strike the retina. The individual learns from the sensation produced by the obliqueness of the rays that a certain muscular

effort is required to permit the object to be seen clearly. The premises in his argument would be readily admitted.

ALLING.

In this lecture EDRIDGE-GREEN (27, **The Cause and Prevention of Myopia**) deals with acquired myopia. The popular view has been that the convergence of the eyes, necessary for reading, has been the dominant factor in producing, by pressure of the extraocular muscles on the globe, that elongation of the eyeball which necessitates the use of concave lenses. Edridge-Green contends that this view is erroneous. He quotes authorities and figures in support of his view. Of the latter the figures of the incidence of myopia in Lanarkshire are of interest:

Urban districts.....	17	per cent.
Rural districts	20.5	per cent.
Mining, Agricultural, Manufacturing	26	per cent.

In convergent squint the squinting eye is usually hypermetropic and as regards occupations, such as compositors, lithographers, etc., in which a large proportion of myopes are found, it is arguable that the occupation was selected on account of the myopia rather than that it was the cause of the condition. Edridge-Green allows that heredity plays its part in the production of myopia in that the sclerotic may be especially prone to give way under pressure or to become affected by disease. Allowing therefore that heredity may be a predisposing cause, Edridge-Green would place most importance on two factors for the production of myopia.

1. Certain diseases occurring in early youth: measles, whooping-cough, and bronchitis. The latter two diseases probably produce their effects by the intermittent rise of intraocular pressure which they cause; while measles has, in all likelihood, a specific action on the sclerotic causing it to soften.

2. The act of lifting heavyweights from a stooping position. The type of person who is especially prone to be affected in this way is one who takes little exercise but who at intervals has to carry heavyweights.

A feeling of tension in the eyes and headache may be noticed

after much lifting. Coughing also may be a potent cause and in adolescents often defective sight may be first noticed after an attack of bronchitis.

Edridge-Green describes color phenomena after lifting heavy weights which he attributes to the circulation of fluids in the interretinal space. The eye is an organ which possesses only a slight degree of distensibility. It is kept distended by the intraocular pressure. The elastic tension of the sclerotic is of great importance and only when the sclerotic is not strong enough to resist the internal pressure upon it does it stretch and produce myopia. This is particularly liable to occur when the eye is soft and growing, but under great stress it may occur at almost any age.

The intraocular pressure varies with the arterial pressure but there is the control mechanism of the capillary venous pressure and the aqueous or secretion pressure so that whereas arterial pressure varies enormously the intraocular pressure only does so to a slight extent. Intraocular pressure rises both when the arterial pressure increases and when the capillary-venous pressure increases. The effect of weight lifting on the intraocular pressure is far in excess of that caused by the extra-ocular muscles in the act of convergence.

Edridge-Green points out that the drainage from the posterior parts of the globe is less free than from the anterior regions and that this may be a factor in the yielding of the posterior portion of the sclera in acquired myopia. Edridge-Green quotes cases illustrating the sudden onset of myopia after extreme effort.

Regarding preventive measures; he advises the abolition of all exercises for children which produce a rapid rise of intra-ocular pressure and in addition to good hygienic surroundings, strongly insists on the importance of preventing the acts of reading and writing being performed in the stooping position or with the eyes cast down, rather the eyes should be directed forwards and the head raised as much as possible.

P. E. DOYNE.

CLAUSEN (26, **Nature of myopia**) declares that a distinction between congenital and school myopia is impossible, because the differentiation must be arbitrary and inaccurate. Conclusions as to the harmful influence of near work drawn from

statistics concerning the increase of myopia in the high schools are of no great value unless an equal number of former students in the lower schools of like age are examined for comparison. Further it is not alone the students who read and write most who become near sighted, and high myopia does not commonly increase after the end of the period of growth. In a quite considerable number also myopia is already present before the school age. Clausen found among the Austrian recruits myopes of all grades who had never been to school, or had been engaged in near work. In such cases heredity must be assumed. Heredity can often be demonstrated when an examination is made of the collateral relationships. He shows by an example that heredity follows certain laws in myopia, and that these agree with Mendel's law of heredity. He believes the idea of school or work myopia to be untenable. No one who has not a predisposition towards myopia will be made near sighted by reading or writing, but anyone thus predisposed will become myopic under the most favorable hygienic conditions. Whether the degree of myopia may be increased by unfavorable conditions, he leaves an open question.

PÖLLOT'S (31, **Transient changes of refraction in diabetes**) patient was a man 34 years old, who had a myopia of 1.5 D., and fell sick with diabetes mellitus. Simultaneously with the onset of the disease his vision improved and he was found to be emmetropic. After four weeks of treatment he was free from sugar and a myopia of 0.5 D was demonstrated after paralysis of the accommodation. A year later the myopia had returned to its original 1.5 D.

FUCHS' (28, **Biastigmatism**) patient, a physician, had good vision with a weak cylindrical correction of a myopic astigmatism, lines appeared to be wavy with one eye, and letters not to be in line. With two cylindrical lenses placed not vertically to each other this trouble was relieved and the vision improved from $\frac{4}{5}$ to $\frac{6}{5}$. This result was arrived at by subjective methods, as skiascopy was misleading. (A similar case was reported by M. L. Foster in the *Refractionist* for May, 1894).

In order to explain the occasional case of good vision in an aphakic eye with the same lens for near and distance LEWIS (29, **Focal adjustment in the aphakic eye**) imagines that the vitreous has a greater density in the center as is known to be

in the case of an ox. He thinks this lens-like structure would be forced forward by the action of the ciliary muscle thus increasing the refractive power of the eye.

ALLING.

V.—THE MOTOR APPARATUS OF THE EYE.

32. BAB. **Psychogenous components of the diplopia in a case of encephalitis lethargica.** *Neurol. Zentralbl.*, xii., p. 391.

33. GOLDSTEIN. **Some unusual symptoms on the part of the lids.** *Deutsch. Zeitschr. f. Nervenheilk.*, lxvi., p. 17.

34. LEIDLER. **Syringomyelia with pure rotatory nystagmus.** *Monatschr. f. Ohrenheilk u. Largngo-rhinol.*, liv., p. 410.

BAB'S (32, **Psychogenous components of the diplopia in a case of encephalitis lethargica**) patient had a paresis of the right abducens with a consequent diplopia. A notable psychical complication was the appearance of colored double images when no colored glass had been used for testing and a continual change had been made in the images. There was no doubt concerning the presence of the diplopia, which disappeared after five days, because it caused great annoyance in spite of the existing lethargy. He does not believe it a matter of hallucination.

In two cases of serous meningitis with choked disk GOLDSTEIN (33, **Unusual symptoms on the part of the lids**) observed that the movements of the eyes and lids were normal when the patient looked downward, but that when he looked up a broad band of sclera became visible above the cornea, which varied in breadth. The phenomenon resembled Graefe's symptom, except that it appeared when the patient looked up, while Graefe's symptom appears when the patient looks down. In these cases the condition was one not of irritation, but of insufficiency, a holding back of the movement of the globe behind that of the lid. Probably an incoördination of the eye muscles was present, as there were no other signs of a true paresis of the elevator of the eyeball. Possibly the impulse to the levator was increased through the involvement of the tract controlling the movement of the eye. A monolateral gaping of the palpebral fissure (Dalrymple's symptom) is easy to detect because the skin is folded more strongly in consequence of the increased muscle tonus. The gaping is more marked on the

part of the upper lid because the tonus of the levator is added. In two cases of tetany Goldstein saw the upper lids drawn back to the upper margin of the orbit. In one case when the patient looked down both lids remained back, and then, when he looked still further down, one lid followed with a jerk. In spastic conditions of the levator he observed an increase of the curvature of the upper lid. The widening of the palpebral fissure in facial paralysis he looks upon as a paralytic Dalrymple's symptom, the retardation of the lid in looking down as a paralytic Graefe's symptom.

In a woman 47 years old with syringomyelia LEIDLER (34, **Syringomyelia with pure rotatory nystagmus**) observed a rotatory nystagmus to the right which increased on looking to the right. Syringing the ear with cold water induced a horizontal nystagmus without influencing the spontaneous form. He inferred a lesion in the most caudal portion of the vestibular center.

(*To be continued.*)

BOOK REVIEWS.

I.—**Atlas of the Slit-Lamp. Microscopy of the Living Eye.** By PROF. DR. ALFRED VOGT (University of Basel). An authorized translation by DR. ROBERT VON DER HEYDT, Chicago. Published by Julius Springer, Berlin, 1921. 136 francs (Swiss).

Professor Vogt's Atlas is of scientific, as well as practical, interest to every ophthalmologist. It opens up a new field for investigation and will undoubtedly create as much furor as followed the appearance of the first Atlas of Ophthalmoscopy.

The "Histology of the Living Eye," as the enthusiasts call it, was made possible by the combination of the Gullstrand slit-lamp with the Zeiss-Czapski binocular microscope. The Gullstrand lamp illuminates the tissues in such a manner as to make it possible to the observer to see the normal and pathological tissue changes as never before. The magnification obtained ranges between 10 and 108 times. The higher magnifications are meant for minute observations and require perfect, but rarely obtainable, immobility of the eye. By this method we are enabled to see in the living eye changes which in former times could only be surmised from the study of microscopic specimens. The satisfaction is given to us of obtaining first-hand information from observing the tissues of the living eye.

The technic of using the apparatus is difficult and can be acquired only by practice and careful attention to minutest details. Prof. Vogt describes 4 methods of examination:

1. Direct lateral (focal) illumination.
2. Transillumination.
3. Direct lateral illumination of reflecting surfaces.
4. Indirect lateral illumination.

Each method has its own indications and brings into view parts of the anterior portion of the eyeball which could not be seen by a different method. The mastering of these methods depends very much on one's thorough familiarity with the apparatus, the very accurate adjustment of the focusing lens and of the angle of incidence of the ribbon of rays thrown by the slit-lamp on the observed eye. It is superfluous to say that unless the technic is thoroughly mastered the study of the eye by high magnification is not satisfactory. The first 21 pages of the atlas try to convey to the reader as accurate an idea as possible of the proper technic. The technic is undoubtedly difficult and it would seem to the reviewer that this introduction could with benefit be amplified.

The second part of the atlas contains a large number of plates illustrating findings which have never been described before:—remnants of the tunica vasculosa lentis, the framework of the vitreous, the various types of lens sclerosis, the appearance of the endothelium on Descemet's membrane in vivo, the nerve fibers in the cornea, folds in Descemet's and Bowman's membranes, and the circulation in new-formed blood vessels in the cornea. New light is thrown on the development of the lens, and its pathological changes; on the genesis and morphology of senile and congenital cataracts; on a great variety of pathological manifestations in the vitreous, such as absorption of the supporting structure, senile and pathological hypertrophy, opacification, deposits of crystals, blood, pigment, and lymphocytes. New minute changes are described in injuries of the eyes, glaucoma, and sympathetic ophthalmia. Three hundred and seventy engravings and plates are accompanied by excellent explanations; these are arranged in five chapters (cornea, lens, iris, vitreous, appendix on conjunctiva and lids) and occupy about 120 pages of the second and most important part of the atlas. Some of the colored plates are real masterpieces and the reviewer has to confess his inability to state which of these are the best or the most interesting. They are all very good, extremely interesting and instructive. The bibliography containing 147 titles will be of value to those intending to go more deeply into this subject.

The study of this atlas leaves one with the feeling that we are

on the threshold of a new epoch of Ophthalmology. Parts of the book may have to be revised in the future, a good deal of it will stand unchanged; the work is destined to be a lasting monument to its author.

M. J. SCHOENBERG.

Slowly the advances made in Europe as regards our special science penetrate this part of the globe. It was so with the Ophthalmoscope, which took years before it was in the hands of every ophthalmologist, and it will take seemingly years before it will be recognized that we have made a bold step further in our scientific knowledge by the introduction of a more improved way of illumination.

After all the first and most essential thing in medicine is the diagnosis. If this can be made earlier and surer than before, we can say that we make progress.

The genius Gullstrand has given us the slit-lamp; the Zeiss people, especially Henker, had the idea of combining it with the Czapski-Schanz corneal microscope and made the handling easier. Now everybody can explore the new field.

But we must not think that we tread on virgin soil. While Germany was isolated from the rest of the world, some investigators still found time to see what could be learned with the new combination, and among others the very enthusiastic and over-elaborate articles by Koeppe succeeded each other in rapid succession.

However, in the quiet region of Aarau, Switzerland, away from universities, Alfred Vogt had begun to distinguish conditions until then unknown, even with the very imperfect illumination of some six years ago. They, in Europe, had then better lamps on the Gullstrand arc than we here; also the illumination was more central than with the present arrangement. This brilliant mind—who gave us at the same time the red-free lamp—of course took hold of the slit-lamp and in a series of articles—in the German language—showed us discovery after discovery.

Vogt has now collected most of his articles in an atlas. This contains his many published observations of the lens and entire new chapters about cornea, iris, vitreous body, and in an appendix the conjunctiva of the bulb and limbus. The 370

pictures are nearly all colored and very well reproduced. It is difficult to appreciate the amount of work which this has involved. All observations have to be made in the dark room and the stereoscopic impression must be reproduced if possible. Nearly all give the exact impression and the atlas as well as the earlier published pictures is a true, reliable, and safe guide.

The possession of the atlas does not allow the student to disregard Vogt's former articles. As lies in the nature of the atlas, the text is rather short; Vogt does not expound in it his theoretical views, nor does he go into details as to technicalities; only from time to time a hint *pour le bon entendeur*. The good literature index at the end of the book will be of material help to the beginner.

The translator is to be commended; it must have been often very hard to find an English equivalent for the German vernacular. I would only like to change the term "senile" to "adult" when speaking of the nucleus in the full-grown, as it seems to me to express better Vogt's view of the nucleus of the lens after puberty. Furthermore in the 106th volume of v. Graefe's *Archiv* he publishes a series of observations of conditions of cornea and anterior chamber which show an extensive field which has never before been explored.

In appreciation of this work in the world literature of Ophthalmology, I should like to place this book on a line with Donders's *Anomalies of Accommodation and Refraction;* it will be a work of which little if anything needs correction, which everybody has to consult who wishes to know something about the microscopy of the living eye, and to which it will be difficult to make valuable additions.

Vogt has made Basel the present center of the new Ophthalmology.

E. E. BLAAUW.

II. **Des Conjonctivites.** Par A. GABRIELIDES, oculiste et bacteriologue de l'hôpital français de Constantinople, etc. Pp. 756. Constantinople in Estia Galata, 1921. Price 55 francs.

This book is in part a complete, and in other parts a rather brief, compilation of all that has up to the present time been written on inflammation of the conjunctiva. The author particularly treats of those cases of conjunctivitis where bac-

teria are regarded as of ætiological importance. As the author is of the opinion that a possible organism found in the discharge of an obscure case of conjunctivitis can presumably be regarded as a cause of this inflammation, he has described a large number of cases of conjunctivitis under the name of the presumptive inciting organism. Thus he speaks of conjunctivitis produced by staphylococci, xerosebacilli, subtilisbacilli, etc.

The book is of value on account of its very careful literary research.

K. LINDNER (Vienna).

CORRESPONDENCE.

Physiological Accommodation.

Sir: In the report of the Proceedings of the Eye Section on page 63 of the January number of the Archives Dr. Duane is quoted as saying "and what Fuchs terms happily physiological accommodation." May I say that the terms physiological and physical accommodation have already been used by Hess and that I am sorry that this fact did not appear in the paper. I am etc.,

E. Fuchs.